UNIVERSIDADE DE LISBOA

FACULDADE DE MEDICINA DENTÁRIA

RELATIONSHIP BETWEEN HAPPINESS, STRESS AND MUSCULOSKELETAL DISORDERS IN PORTUGUESE DENTISTS

MARIA DO ROSÁRIO OLIVEIRA MEXIA ESTEVES

Orientadores:

Doutor Alexandre Josué Costa Cabeleira da Silva Cavalheiro

Doutora Carla Marina Madureira de Matos Moleiro

Doutora Nancy da Silva (San Jose State University, USA)

Tese especialmente elaborada para obtenção do grau de Doutor em Medicina Dentária, Especialidade de Dentisteria Conservadora

2016

UNIVERSIDADE DE LISBOA

FACULDADE DE MEDICINA DENTÁRIA

RELATIONSHIP BETWEEN HAPPINESS, STRESS AND MUSCULOSKELETAL DISORDERS IN PORTUGUESE DENTISTS

MARIA DO ROSÁRIO OLIVEIRA MEXIA ESTEVES

Orientadores: **DOUTOR ALEXANDRE JOSUÉ COSTA CABELEIRA DA SILVA CAVALHEIRO**

DOUTORA CARLA MARINA MADUREIRA DE MATOS MOLEIRO

DOUTORA NANCY DA SILVA (SAN JOSÉ STATE UNIVERSITY, USA)

Tese especialmente elaborada para obtenção do grau de Doutor em Medicina Dentária, Especialidade de Dentisteria Conservadora

Júrí:

Presidente: **Doutor Mário Filipe Cardoso de Matos Bernardo**, Professor Catedrático e Presidente do Conselho Científico da Faculdade de Medicina Dentária da Universidade de Lisboa

Vogais: **Doutora Eunice Virgínia Valdez Faria Bidarra Palmeirão Carrilho**, Professora Associada com Agregação da Faculdade de Medicina da Universidade de Coimbra

Doutora Maria Augusta Duarte Gaspar, Professora Auxiliar Convidada da Faculdade de Ciências Humanas da Universidade Católica Portuguesa

Doutora Carla Marina Madureira de Matos Moleiro, Professora Auxiliar da Escola de Ciências Sociais e Humanas do ISCTE-Instituto Universitário de Lisboa

Doutor Mário Pinto Simões, Professor Auxiliar com Agregação da Faculdade de Medicina da Universidade de Lisboa

Doutor António Emílio Peixoto Vasconcelos Tavares, Professor Catedrático Jubilado da Faculdade de Medicina Dentária da Universidade de Lisboa

Doutor Alexandre Josué Costa Cabeleira da Silva Cavalheiro, Professor Auxiliar da Faculdade de Medicina Dentária da Universidade de Lisboa

2016

… may all beings, as numerous as space is vast, be peaceful and happy…

To my sons Miguel and Frederico

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDIX

LIST OF ABREVIATIONS

AHI	- Authentic Happiness Inventory
ANOVA	- Analysis of Variance
CNRS	- Centre National de la Research Scientifique
DNA	- Deoxyribonucleic acid
FMDUL	- Faculdade de Medicina Dentária da Universidade de Lisboa
GDP	Gross Domestic Product
GHQ	- General Health Questionnaire
GNH	- Gross National Happiness Index
GSRH	- General Self-Rated Health Measure
HIV	- Human Immunodeficiency Virus
IgA	- Immunoglobulin A
LKM	- Loving-Kindness Meditation
MANOVA	- Multivariate Analysis of Variance
Max	- Maximum
Min	- Minimum
MS	- Musculoskeletal
MSC	- Musculoskeletal Complaint
MSD	- Musculoskeletal Disorder
MSDs	- Musculoskeletal Disorders
MSP	- Musculoskeletal Pain
MSQ	- Musculoskeletal Questionnaire
MSS	- Musculoskeletal Symptom
N=	- Number of Answers

NA - Negative Affect

NE - Negative Emotion

ns - non significant

OECD - Organization for Economic Co-operation and Development

PA - Positive Affect

PAI - Positive Activity Interventions

PANA-X - Positive and Negative Affect Schedule- Expanded Form

PANAS - Positive Affect and Negative Affect Scale

PCA - Principal Component Factor Analysis

PE - Positive Emotion

PP - Paper/Pencil Sample

PPI - Positive Psychology Interventions

PSS - Perceived Stress Scale

PWB - Positive Well-being

ROT - Rules of Thumb

SA-DH - Subjective Authentic-Durable Happiness

SA-DHS - Subjective Authentic-Durable Happiness Scale

SD - Standard Deviation

SFH - Subjective Fluctuating Happiness

SFHS - Subjective Fluctuating Happiness Scale

SGT - Self-Generated Thoughts

SHM - Sustainable Happiness Model

SNMSQ - Standardized Nordic Musculoskeletal Questionnaire

SPEMD - Sociedade Portuguesa de Estomatologia e Medicina Dentária

SPSS - Statistical Package for the Social Science

SRH - Self-Rated Health Measure

SSHM - Self-centeredness/Selflessness Happiness Model

SWB - Subjective Well-being

SWLS - Satisfaction With Life Scale

TS - Total Sample

UK - United Kingdom

USA - United States of America

US - United States

WB - Well-being

WDH - World Database of Happiness

WHO - World Health Organization

WHR - World Happiness Report

PoM Peace of Mind Scale

PREAMBLE

The preamble to this thesis dissertation for the PhD degree in Dentistry refers to the millennial issue of classical antiquity: does Reason have predominance over Emotion or can Emotion supersede Reason, despite the will of man?

Along my life I have witnessed that positive emotions are beneficial to health. In certain circumstances, they even could have a healing effect, with no more side effects beyond the underlying well-being. On the other hand, negative emotions may be extremely damaging and harmful to physical and mental health, and may even lead to death; whether slow and depressive or abrupt, deliberate, and suicidal.

During my academic life, either as student or as Assistant Professor (since 1980) in the Faculty that I represent, I often witnessed Emotions overrule Reason, while betraying and erasing from memory days and weeks of careful and arduous work, of intense study.

As a clinician I saw how some support or psychological comfort might seem to have healing effects for fear and fears, for phobias and anxiety. I saw how, sometimes, severe pain and vagal crises could ultimately disappear with the power of affection. I also saw the placebo effect.

Without having the knowledge or claim to enhance or diminish Reason or Emotion I cannot, however, fail to recognize the effect of Emotions on

Reason. Or, to wonder what it would be like if negative emotions could be regulated with the primacy of reason, positivism and will.

The topic of emotional intelligence, a concept already widely discussed and studied in several internationally renowned universities, caught my attention and inspired me into the study of emotional regulation.

Thus, in 2008, I directed most of my research and my scientific studies to the area of the Psychology of Emotions, in order to enrich both the clinical practice and teaching of Dentistry, whether it be for the students or the dentist as a Human Being.

From 2008 to 2010, I enrolled in the first Masters degree in this area of study in Portugal. In the process of developing and defending the first thesis of the Masters in Psychology of Emotions in Portugal, with the topic "Distress and Emotional Regulation in Dental Students in Portugal", I came to further strengthen my strong conviction that it is extraordinarily important to study and get to know better how thoughts are related to feeling.

The strong emphasis of Ethics and respect for the patient as a whole, transmitted by teachers during my academic training, coupled with the advancement of Neuroscience on this issue, propelled my thoughts to the possible clinical implications of this topic. Moreover, these were pressing and pertinent reasons for me to develop my PhD research in the study of emotions and health of Portuguese dentists where, to my knowledge, in this area there is no similar research work.

It could be a challenge wanting to join worlds that apparently seem distinct! But, is not after all the Doctor also a Man, a complete and complex Being, indivisible as a whole? Is it not the exercise of Medicine a responsibility

that must be performed away from the disturbance of the negative emotions? And done by someone who has and knows how to develop positive affects, empathy and nurture in the patient the art of being happy and healthy?

I feel strongly that the "Study of the relationship between Happiness, Stress and Musculoskeletal Disorders in Portuguese Dentists", can be a contribution to improving the balance between reason and emotion in Dentistry and in the lives of men/women who practice it. With the advancement of neuroscience and the neuroplasticity capacity, we know today that Man has the ability to train the mind with beneficial brain, mental and physical outcomes. Both Man and the Doctor! Coming together to cure diseases and nurture health and well-being through positivity.

This preamble cannot be concluded without expressing my gratitude to Life itself and the people that caused me experience how powerful emotions can be, as well as I feel gratitude to the neuroscientists who have demonstrated so well the connection between the body, the brain and the mind.

PERSONAL THANKS

As I have gone through this journey of writing my thesis, many people have travelled with me to whom I would like to express my gratitude.

First and foremost, I thank my Parents for the way they always emphasized strong values, which were nobly integrated into our daily life.

Special thanks to my co-advisers:

- Professor Nancy da Silva (San Jose State University, USA) whom, despite the physical distance between us, helped me with bibliographic research and all the required Statistical Analysis. I feel so grateful for all advice you offered me, for your motivation and untiring support of my project and for all the guidance and encouragement you so attentively provided me.
- Professor Carla Moleiro, for all the time you dedicated advising and correcting my work, on so many occasions. Thank you so much for all corrections you did over my thesis.

I have had the good fortune, of being blessed all my life with good friends, teachers and colleagues. I thank all of you who have lived side by side with me, sharing in sadness and joy, always making me feels that Life is precious and that Happiness must be sought and shared.

Special thanks must be expressed to some special people who have honored me with their inspiration, knowledge, support and kindness :

- To the founders of Escola Superior de Medicina Dentária de Lisboa, for having been so committed in their mission to making it possible for Portuguese people to have such a valuable dentistry institution as we have. In particular, I express my gratitude to Professors Doctor Armando Simões dos Santos, Doctor Bação Leal and Doctor António Vasconcelos Tavares, who have always sought updated

training for the students, honoring not only the institutions they belong to, but also promoting and sharing knowledge between Faculties and Universities

- To Professor Doctor Manuel Clarimundo Emílio, with whom I have had the honor to work with, as assistant professor for 27 years. I feel special gratitude and respect for the way he has always taught and supported students on clinical teaching. Personally I not only learned from him as a student, but also the way to teach Dentistry. More significantly, I was privy to his precious concepts and teachings on Ethics, as in his respect for patients and rigorousness in teaching and in living life with integrity. Without him, Dentistry in Portugal would not be the way it is nowadays. So, to you Professor Clarimundo, I offer my deep gratitude not only as a student and as a "resilient" assistant, but also as a Portuguese dentist and a Portuguese woman!
- To Dr. Jorge de Melo, for imprinting in dental medicine those values that make a medical student become a full Doctor. His Ethics, his knowledge, his awareness and understanding of life, health and illness make him an admirable man I have the honor to call a friend.
- To Professors Doctor Luís Pires Lopes, Doctor Mário Bernardo and Doctor João Aquino who have motivated and encouraged me to explore my topic of choice, and for being always available for queries and to respond to any investigative requests I made of them. Their openness to new topics of

research, their motivational disposition and their cooperation between fellows allowed me to explore my thesis and to be able to share it with other institutions.

- To all my Colleagues from the Dentistry Department at Faculdade de Medicina Dentária da Universidade de Lisboa. Although our connection began as colleagues, they soon became friends. Despite the fact that I could be their mother, they have supported me during all the years I´ve been preparing my Phd thesis as if I was a daughter they love and protect. Thank you so much Alexandre, Bernardo, Raquel, Catarina and Nica! You are the best colleagues one can have!
- To my dear tia Zeca, for her tenderness, her protection and exemple of life.
- To my dear friends Ana e Gina, to Teresa e Alberto, to Annemarie e Maria O´Reilly for their friendship for decades.
- To João who, carefully took care of all my patients on days I could not be present at my private practice.
- To Lucinda, D. Maria, Isabel, Emília e Bisa for making my daily life easier, by taking care of my home and my dentistry clinic.
- To professor Ana Santos for all the English language corrections, which she made with great commitment and kindness any time it was required.
- To Isabel Vieira, for her cooperation and tenderness.

Last but not least, a very special thank you:

- To Matthieu Ricard, whose advice was a catalyst in my pursuing this area of study. He was a fundamental resource in providing me with a rich bank of scientific study of "Happiness". His integral role in the collaborative development of questionnaires for this thesis was central for data collection. I am extremely grateful for his extensive knowledge, continual study, conference work and publications on the subjects of " Happiness and Altruism", which have expanded worldwide and contributed to an improved quality of life.
- To Romina, who tenderly and efficiently corrected and re-organized, tables, figures and papers each and every time I needed it done. Her availability and kindness made these years of my thesis happier and less stressed. Your work here proves that youth can walk side by side with professionalism!
- To Fred, my son, for the motivation and the support he has always given me during these years.
- To Lourdes, for always being with me supporting me and my family in both sadness and joy, every single day of the last forty years. Thank you for nourishing me and my projects, for being the best friend I could have, and for being a godmother to my kids and myself .
- Lastly, words can not express the special thanks that need to be imparted to Professor Doctor Alexandre Cavalheiro, my main adviser. His devotion, his careful oversight, detailed and conscientious supervising approach to my thesis, has always

inspired me to pursue my dreams of bringing this work to fruition. Throughout all these years he always motivated me, and pushed me to investigate and to “keep the momentum”! Every time I needed, he always made extra time, from his University duties or private life, to meet with me, to correct my work, and to advise and guide me when needed. Furthermore, I would like to thank Professor Alexander Cavalheiro for the meticulous and notable way he approaches the teaching of Dentistry at Faculdade de Medicina Dentária da Universidade de Lisboa.

As long as the Universe exists, as long as I´m part of it, may I glorify God, my Guides and all the above mentioned people, by contributing to the happiness of as many living beings as there can be!

SUMMARY

Dentistry, taking into account its need for concentration, accuracy and manual skills as well as physical and psychological requirements, is one of the most stressful professions and the one with most frequently reported musculoskeletal disorders.

Dentists present high levels of stress, which may impair their physical and mental health, their well-being and personal relationships, and the quality of treatments that they provide to patients.

Stress is related to the onset of musculoskeletal disorders (MSDs), which are a major health concern for dentists.

Happiness precedes and creates several favorable life outcomes predicting quality of life and longevity, with countless benefits not only on a individual basis, but also for the families and the communities to which people belong. Happy people live healthier and longer lives, both physically and mentally.

The main purpose and the novelty of the present study was to assess the relationship between stress, happiness (both fluctuating and authentic-durable) and musculoskeletal disorders (MSDs) among dentists.

The first part of this study includes the validation of Subjective Fluctuating Happiness Scale (SFHS) and Subjective Authentic-Durable Happiness Scale (SA-DHS) for the Portuguese population.

In order to validate SHFS and SA-DHS, two other measures have been applied: Positive and Negative Affect Scale (PANAS) and Satisfaction with Life Scale (SWLS). The entire questionnaire was applied nationwide simultaneously using both online (n = 1338) and paper/pencil methods (n = 1018), making a total of 2356 respondents.

The Portuguese versions of Subjective Fluctuating Happiness Scale and Subjective Authentic-Durable Happiness Scale had high internal consistency in every sample. For the total sample, the Cronbach's alpha was .90 for SFHS and .93 for SA-DHS; the mean values were: 3.58, and 4.60 respectively for SFHS and SA-DHS. Both scales had adequate convergent validity. Item 15, in the Portuguese version, loaded in Contentment Subscale.

Both scales showed high reliability and seemed to be a valid tool for measuring and distinguish between fluctuating (SFHS) and authentic-durable happiness (SA-DHS), for both online and paper/pencil survey methods.

To assess the relationship between stress, happiness and musculoskeletal disorders (MSDs) among dentists, four measures have been applied: SHFS, SHA-DS, Perceived Stress Scale and a musculoskeletal complaint (MSC) questionnaire, adapted for the present study by the author. Portuguese dentists were surveyed through online method (n = 508).

Mean stress level was 22.99 and 17.62 on full and short scales, respectively. The stress was positively correlated with the MSC and the fluctuating happiness, and negatively correlated with authentic-durable happiness.

The prevalence of MSC for at least one body region was 88.2% for the last week, and 90.7% for the last year. MSC were positively correlated with fluctuating happiness and negatively with authentic-durable happiness.

Subjective happiness scored 3.32 on fluctuating and 4.54 on authentic-durable, in a 1-7 scale.

Stress and MSC were high among Portuguese dentists, and higher among female dentists.

Fluctuating happiness and MSC were predictors of stress.

Portuguese dentists presented high levels of stress and MSC, which were positively correlated with each other, and negatively related to authentic-durable happiness and to physical activity.

KEYWORDS: Stress; Musculoskeletal disorders, Authentic-durable happiness; Fluctuating happiness, Dentists, Validation.

RESUMO

INTRODUÇÃO

A Medicina Dentária é uma nobre profissão que exige de quem a exerce não só o saber da ciência e a arte de a pôr em prática, como também o desafio de o fazer em ambiente limitado pelo espaço físico da cavidade oral e pelas condicionantes psicofisiológicas do paciente.

A limitação do campo operatório, a necessidade de manter posturas estáticas, a concentração mental e a acuidade manual que exige, a par das exigências psicológicas (referentes ao médico dentista e ao paciente), fazem dela uma das mais exigentes e stressantes profissões ligadas à saúde, com níveis elevados de stress e de lesões músculo esqueléticas (LME).

É crescente a evidência da relação do stress com a saúde e, em especial com algumas patologias como as doenças cardiovasculares, neuro-endócrinas e as relacionadas com o sistema imunitário. O stress pode também provocar alterações na forma e na função de algumas zonas do cérebro.

Os dentistas têm níveis de stress elevados e superiores aos da população em geral, o que pode comprometer a sua saúde física e mental, o bem estar, as suas relações pessoais e o exercício da profissão.

O stress, considerado uma das causas de reforma antecipada dos dentistas, está fortemente relacionado com o aparecimento de LME, que constituem o seu maior problema de saúde, com prevalência elevada de queixas nas zonas correspondentes às coluna cervical e lombar, aos ombros e às mãos e pulsos.

A felicidade, por seu lado, tem uma forte relação com a saúde, com a longevidade e com a qualidade de vida, estando associada a inúmeros benefícios a nível individual, familiar e social. As pessoas felizes vivem mais tempo e são mais saudáveis, física e mentalmente.

O objectivo deste trabalho foi avaliar os níveis de felicidade e estudar a relação desta com o stress e com a presença e a intensidade de sinais e sintomas de LME, entre os dentistas portugueses.

De acordo com o objectivo exposto, foram desenvolvidos três estudos:

Estudo1, validação para a população portuguesa das escalas selecionadas para a avaliação dos níveis de felicidade subjetiva flutuante, instável (SHFS) e de felicidade subjetiva autêntica e estável (SHA-DS);

Estudo2, avalia os níveis de felicidade e de stress, bem como a presença e intensidade de sinais e sintomas referentes a LME na população de dentistas portugueses

Estudo3, pesquisa a “Relações entre a Felicidade, o Stress e as LME nos dentistas portugueses”

Em todos os estudos foram aplicadas as recomendações éticas de Helsínquia.

ESTUDO1:

Validação das escalas de felicidade subjetiva flutuante (SFHS) e felicidade autêntica e estável (SA-DHS) para a população portuguesa

Metodologia: após a permissão dos autores da escalas originais, foi desenvolvido o processo de tradução e retroversão para a elaboração das escalas em língua portuguesa, com a cooperação de 4 tradutores e o esclarecimento de um dos autores das escalas originais.

Medidas: foram aplicadas, simultaneamente com as escalas de felicidade subjetiva fluctuante e felicidade subjetiva estável a validar, duas outras medidas de bem estar, largamente utilizadas e já validadas para a população portuguesa: as escalas de afectos positivos e afectos negativos (PANAS) e uma escala de satisfação com a vida (SWLS).

Estudo piloto, com uma amostra de conveniência de 40 pessoas de idades diferentes e com diferentes níveis de literacia. A análise estatística do estudo piloto justificou a aplicabilidade dos instrumentos no estudo principal.

Aplicação dos questionários à população de Portugal (Continente, ilhas e emigrantes), simultaneamente nas versões "papel" e *online*, de modo a abranger uma população o mais diversificada possível.

A amostra foi constituída por 1.338 respostas *online* e 1018 na versão "papel". No total, a amostra compreendeu 2.356 portugueses, com idades compreendidas entre os 18 e os 91 anos, representando todos os distritos do continente português bem como das ilhas Madeira e Açores e de emigrantes em 30 países diferentes.

A análise estatística compreendeu a análise factorial e descritiva e o estudo das características psicométricas das escalas para cada uma das

amostras - paper/pencil, online e total. Posteriormente os dados foram comparados (T-test) entre amostras.

Resultados: A felicidade flutuante estava negativamente relacionada com a felicidade autêntica e estável, com o contentamento e com a paz interior; e, ainda, com os afectos positivos, com a satisfação com a vida e com o envolvimento religioso. A felicidade autêntica e estável estava negativamente correlacionada com os afectos negativos; e positivamente relacionada com o contentamento, os afectos positivos e com a satisfação com a vida. Os níveis de educação e socioeconómicos estavam negativamente relacionados com a felicidade flutuante e positivamente com a felicidade autêntica e estável.

Os coeficientes de fiabilidade interna foram de .90 para SFHS e .93 para SA-DHS.

A análise factorial da versão portuguesasa de SA-DHS mostrou que a escala tem dois factores, o "contentamento" e a "paz interior", correspondentes às distintas dimensões da felicidade. Na versão portuguesa o item 15 pertence à subescala do contentamento.

Conclusão: A versão portuguesa das escalas de felicidade subjetiva, flutuante (SFHS) e autêntica e estável (SA-DHS), apresenta boas propriedades psicométricas para ambas as escalas, sendo uma medida fiável e adequada para os objectivos a que se propõem: a medição dos níveis de felicidade flutuante e estável. Na versão portuguesa da escala para a felicidade estável (SA-DHS) o item 15 pertence à subescala do contentamento .

Ambas as escalas poderão ser aplicadas em versão *online* ou "papel", sem prejuizo das suas propriedades psicométricas

ESTUDOS 2 E 3

Avaliação da presença e da intensidade (Estudo 2), e da relação (Estudo 3) entre a felicidade, o stress e os sinais e sintomas de lesões músculo-esqueléticas (LME) entre os dentistas portugueses.

Metodologia:

Estudo piloto, com uma amostra de conveniência de 45 dentistas (idades entre os 23 e os 59 anos), de 17 diferentes anos de graduação.

As medidas usadas foram as versões portuguesas das escalas de felicidade SFHS e SA-DHS, do General Health Questionnaire (GHQ) e do Standardized Nordic Musculoskeletal Questionnaire.

Na sequência dos resultados deste estudo piloto e da Prova de Acesso Pedagógico, foi decidido quer a substituição do GHQ por uma escala direccionada ao stress quer a elaboração de um questionário para avaliar a presença e a intensidade de sinais e sintomas de LME, simplificado e adaptado à população a estudar.

Medidas:

1. Perceived Stress Scale (PSS), para avaliação dos níveis de stress
2. Subjective Fluctuating Happiness Scale (SFHS), para avaliar os níveis de felicidade subjetiva flutuante, instável,
3. Subjective Authentic-Durable Happiness Scale (SA-DHS), para avaliar os níveis de felicidade autêntica e estável,
4. Questionário de pesquisa de sinais e sintomas de lesões músculo-esqueléticas (PSSLME), numa versão desenvolvida para este estudo com base no questionário nórdico e nas suas versões portuguesas.

Ambas as medidas de felicidade subjetiva (SFHS) e (SA-DHS), tinham sido validadas para a população pela autora, e estão apresentadas no Capítulo II desta tese.

Os questionários foram aplicados *online* a uma amostra de conveniência de 525 dentistas portugueses. A amostra final foi de 508 dentistas, com exercício clínico no continente português e nas ilhas da Madeira e Açores.

Resultados:

Os valores médios de stress encontrados foram de 22.99 e de 17.62, respectivamente para a escala completa e para a de 10 itens.

88.2% e 90.7% dos dentistas referiram ter tido queixas relacionadas com lesões musculo-esqueléticas (LME) durante a última semana e o último ano, respectivamente, em pelo menos uma das zonas do corpo indicadas no questionário.

As queixas mais frequentes relacionadas com LME foram, na última semana, as referentes ao pescoço (56.4%), coluna lombar (54.9%), ombros (53.4%) e pulsos ou mãos (37.7%); e, no último ano, as relacionadas com o pescoço (69.2%), a coluna lombar (64.3%), os ombros (58.6%), a coluna dorsal (48.4%) e pulsos ou mãos (46.4%).

Numa escala de 1 a 7, os níveis médios de felicidade foram de 3.32 para a flutuante e de 4.54 para a autêntica e estável; o contentamento e a paz interior tiveram os valores de 4.44 e 4.75, respectivamente.

Os dentistas portugueses apresentaram níveis elevados de stress e de queixas de lesões músculo-esqueléticas (LME), superiores aos da população

portuguesa. O stress e as queixas de LME não estavam correlacionados com a idade, nem com os anos de exercício clínico. Contudo, estavam relacionados com o género: as mulheres apresentavam níveis mais elevados de stress e de queixas de LME do que os seus colegas do sexo masculino.

O stress e as queixas de lesões músculo esqueléticas (LME), estavam correlacionadas: positivamente entre si e com a prevalência da felicidade flutuante, instável; negativamente, com os níveis de felicidade autêntica e estável, com o contentamento, com a paz interior e com a prática de atividades desportivas.

As lesões músculo-esqueléticas foram predictoras para o stress. A prática de atividades desportivas é predictor para a felicidade autêntica e estável.

Conclusão

Os dentistas portugueses reportam níveis elevados de stress e de sinais e sintomas de lesões músculo-esqueléticas, ambos positivamente correlacionados entre si; e, negativamente relacionados com a felicidade autêntica e estável e com a prática de atividades desportivas.

Parece ser recomendado que os dentistas se envolvam com regularidade em atividades promotoras do equilíbrio da saúde física e mental, bem como em atividades desportivas.

PALAVRAS-CHAVE: stress; lesões músculo-esqueléticas; felicidade flutuante e estável; dentistas; validação.

CHAPTER I

GENERAL PURPOSE AND THEORETICAL INTRODUCTION

GENERAL PURPOSES

The main purpose of the present study was to assess, in Portugal, the possible relationship between happiness, stress and the musculoskeletal injuries from which dentists often complain.

In order to accomplish this goal, the study was developed to explore these constructs among Portuguese dentists. As the scales chosen for happiness were brand new in their concepts and not yet validated for the Portuguese population, the author developed the first study - Study 1, “Validation of subjective happiness scales for Portuguese population", presented in Chapter II.

According to the explained purposes, this thesis is organized as following:

- Chapter I: the theoretical support for the research development;
- Chapter II: Sudy1, subjective happiness scales validation for the Portuguese population

- Chapter III: the study of stress, happiness and musculoskeletal disorders in Portuguese dentists
- Chapter IV: the study of the relationship between happiness, stress and musculoskeletal disorders in Portuguese dentists
- Chapter V: Discussion
- Chapter VI: Conclusions

THEORETICAL INTRODUCTION

The theoretical support for the progress of these studies is presented and organized as following:

1st: "The art of being a dentist", with some considerations about the honorable art of Dentistry,

2nd: "Health", makes an approach to mental health,

3rd: "Emotions", presents the bases for understanding the emotions and the scientific knowledge related to them,

4th e 5th: "Stress" and "Musculoskeletal Disorders" concentrates the disease in its own forms, according to numerical order, and

6th: Presents the relationship between Stress, Musculoskeletal Disorders and the Positive and Negative Emotions.

At last, but not at least, it will be emphasized the "Positive Approach" and especially "Happiness", as a basis for both physical and mental health, in its wider approach, which is already defined by the World Health Organization.

THE ART OF BEING A DENTIST

Dentistry, in spite of being a stimulating occupation, is considered a very demanding profession, both physically and mentally, with several occupational risks as, among others, the musculoskeletal disorders (Ayers, Thomson *et al.*, 2009).

The practice of dentistry is stressful (Ayers, Thomson *et al.*, 2009; Ayers, Thomson *et al.*, 2008; Montasem, Brown *et al.*, 2013; Newton, Allen *et al.*, 2006; Newton & Gibbons, 1996; Turley, Kinirons *et al.*, 1993; Wilson, Coward *et al.*, 1998). It is considered as one of the most stressful professions in the health related professions (Burke, Main *et al.*, 1997; Cherniack, Dussetschleger *et al.*, 2010; Frasquilho, 2005; Palliser, Firth *et al.*, 2005; Schmitter, Liedl *et al.*, 2008) and the one reporting more musculoskeletal injuries (Cherniack, Dussetschleger *et al.*, 2010).

Dentistry has been cited as being one of the most demanding professions to practice (Wilson, Coward *et al.*, 1998). Apart from the physical and psychological requirements (Ayers, Thomson *et al.*, 2009) it requires concentration, accuracy and manual skills (Perez-Padron, Bernabé *et al.*, 2010; Tezel, Kavrut *et al.*, 2005).

Physical requirements for the practice of dentistry come from the need of keeping positions of muscle contraction for extended periods of time while maintaining, simultaneously, manual precision and gentle pressure during treatment (Palliser, Firth *et al.*, 2005; Perez-Padron, Bernabé *et al.*, 2010).

The main psychological demands in practice of dentistry are the responsibility of space and labor management, the pressure to accomplish schedules and calendar appointments and to deal with patient's psychological demands (Palliser, Firth *et al.*, 2005; Perez-Padron, Bernabé *et al.*, 2010).

The practice of dentistry may have negative effects (Ayers, Thomson *et al.*, 2009; Gorter, Eijkman *et al.*, 2000). Dentists present high levels of anxiety, depression and stress (Alexander, 2001; Hu, Gorenstein *et al.*, 2007; Palliser, Firth *et al.*, 2005; Schmitter, Liedl *et al.*, 2008; Winwood & Winefield, 2004). They are prone to exhaustion, severe emotional tension (Taskaya-Yilmaz, Ceylan *et al.*, 2004), and a high suicide rate (Alexander, 2001; Stack, 2001), in comparison with the general population (Newton, Allen *et al.*, 2006; Palliser, Firth *et al.*, 2005).

Musculoskeletal disorders (MSDs) and neurotic symptoms, together with cardiovascular diseases, lead to premature retirement among dentists (Ayers, Thomson *et al.*, 2009; Burke, Main *et al.*, 1997).

Stress and burnout - a state of physical, emotional and mental exhaustion, caused by a long-term involvement in an emotionally demanding situation are common in healthcare workers (Montgomery, Panagopolou *et al.*, 2006). They have increased in the last decade with health and performance implications (Prins, Gazendam-Donofrio *et al.*, 2007), constituting a growing problem, both in the general population and among doctors (Dahlin, Joneborg *et al.*, 2007).

The high prevalence of stress and burnout among dentists jeopardizes (Newton, Allen *et al.*, 2006) their personal and professional life (Brake, Bouman *et al.*, 2007) and contribute to the onset of symptoms and injuries of the musculoskeletal system (Ayers, Thomson *et al.*, 2009).

The influence of Age and Gender

The greater the experience of the dentist, the lower is their susceptibility to get into stress with the working team and with patients (Cooper, Watts *et al.*, 1987).

According to some studies, the increasing of chronological age and years of service results in lower levels of depersonalization (Taskaya-Yilmaz, Ceylan *et al.*, 2004) and stress higher levels of job satisfaction. It seems that people develop ways of dealing with problems (Taskaya-Yilmaz, Ceylan *et al.*, 2004), becoming more resistant to pressure or developing coping strategies that help them overcome the most difficult situations (Tabak & Koprak, 2007).

On other hand, age is related to the onset of musculoskeletal injuries (MSDs), as well as with years of clinical practice (Szymanska, 2002).

There is an increase of women entering the job market (Montgomery, Panagopolou *et al.*, 2006). In the sixty/seventieths women started showing more academic qualifications. However, it was from the 80s that significantly increased the number of women with different professions, especially in the areas of accounting, law, and medicine (Crompton & Lyonette, 2011).

In the late 80s it was considered that the medicine learning and training was found to be more stressful for women than men (Harvill, 1986). However, while the levels of well-being and mental health in female dentists were identical to the general population, the male dentists showed lower levels of welfare than the general population (Cooper, Watts *et al.*, 1987).

The influence of gender on stress levels felt during the practice of dentistry differs among authors. While some studies reported that women do not have levels of occupational stress or burnout higher than those found in men (Taskaya-Yilmaz, Ceylan *et al.*, 2004), other studies reported that

women dentists have twice the risk of developing high levels of stress, comparing to their male peers (Pozos-Radillo, Lopez *et al.*, 2008).

HEALTH

Health is defined by the World Health Organization (WHO) as a complete state of physical, mental and social well-being and not simply the absence of disease or infirmity (Keyes, 2007; Lee, Yoon *et al.*, 2012; Moljord, Moksnes *et al.*, 2011). The connection between brain and body makes reciprocal the influence between mind and body (Davidson, 2011). For Damásio (2010) only death or mental diseases are able to interrupt the close interrelationship between body and brain.

Health is important (Gana, Bailly *et al.*, 2013) and multifactorially determined (Hjemdal, Friborg *et al.*, 2012). Physical health is a multidimensional construct, with a number of different health related conditions (Røysamb, Tambs *et al.*, 2003)

Health is strongly correlated with subjective well-being (Diener, Suh *et al.*, 1999); they are interdependent and determinant to each other (Gana, Bailly *et al.*, 2013).

Untill recent years, mental health has been undefined and unmeasured. In 2004, the WHO published the historic first report on mental promotion defining mental health not only by the absence of mental illness but also with the presence of positive references (Keyes, 2007). Nowadays, mental health is considered an essential individual factor for happiness

(Durand & Smith, 2013; Helliwell, Layard *et al.*, 2015; "World happiness report ", 2013; "World happiness report," 2015).

The World Health Organization define mental health as “a state of well-being in which the individuals realize his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” (Keyes, 2007). Epigenetics - the expression of genes, can be activated or deactivated not only by the environment but also by our mental states (Ricard, 2015).

Optimal mental health is relatively low (Catalino & Fredrickson, 2011): over 20% adults had some form of mental disorder (Keyes, 2007). Mental disorders became a major health problem in industrialized societies with 31 to 50% of the population suffering from them at some point in life (Grinde, 2012). Anxiety and depression are devastating mental illnesses (O’connor, Dinan *et al.*, 2012) reported to be the more common mental problems (Grinde, 2012). High levels of anxiety are correlated with a shortened life span (Grinde, 2005)

Mental health is so important for happiness (Robinson, Kennedy *et al.*, 2012) that some authors (Helliwell, Layard *et al.*, 2013; "World happiness report ", 2013) considered it as being the single most important determinant of individual happiness. It is reported with several benefits for the individual and the society- less lost days on work, lower health care utilization (Catalino & Fredrickson, 2011). Mental health is considered by some as being even more important for happiness than physical health is (Robinson, Kennedy *et al.*, 2012). On the contrary, mental illness is the single most important cause of unhappiness (Helliwell, Layard *et al.*, 2013; "World happiness report ", 2013).

Flexible and adaptive emotions regulatory capacities are considered right tools to increase happiness and well-being (Gruber, Mauss *et al.*, 2011).

Happiness has a positive effect on health, with happy people showing less psychopathological problems as depression, schizophrenia and hypochondriasis (Nave-Leal, Pais-Ribeiro *et al.*, 2012). Being a complementary construct for mental health (Ribeiro, 2012), it is essential for mental and physical health (Lyubomirsky, Sheldon *et al.*, 2005). Happiness does not cure diseases but protects people against them and aids the healing process (Nave-Leal, Pais-Ribeiro *et al.*, 2012).

In 2008, Martin Seligman proposed a new field; the one of positive health in which he described a definable and measurable state beyond the mere absence of diseases, a buffer against physical and mental illness (Seligman, 2008; Seligman & Csikszentmihalyi, 2000).

EMOTIONS

Emotions are responses to circumstances (Gruber, Mauss *et al.*, 2011), preparing the body to action, according to the relevancy of the context. Emotional states could pleasant, unpleasant or have some reinforcement values (Sabini & Silver, 2005). They are adaptive (Gruber, Mauss *et al.*, 2011), being sometimes beneficial, some others detrimental (Gruber, Mauss *et al.*, 2011), depending on the moment they happen (Gross & Thompson, 2007).

The emotions are a multifaceted and extended process that involves changes on the subjective, behavioral and physiological (Gross & Thompson, 2007; Gruber, 2011), central and peripheral areas (Gross & Thompson, 2007). Emotions can have an immediate impact on physiology, affecting not

only the body but also the thinking and the behavior (Fisher & Shapiro, 2006). Those happen when facing a certain situation that is felt by themselves as relevant to their personal goals. It is the meaning and relevance that each one gives to the situations they have to deal with, regardless the situations themselves, which start an emotion (Gross & Thompson, 2007).

Being difficult to definite objectively, emotions are also difficult to study scientifically (Castelar, 2006). The wide range of observable behaviors, expressed feelings and physiological changes included in the complex world of emotions, create a diversity which makes their study even more difficult (Breedlove, Rosenzweig *et al.*, 2007). The lack of research on the subject of emotions till the last years of the XXth century, as if emotions were not worthy of credit, has been considered by Antonio Damásio as a scientific neglet (Damásio, 2000).

However, emotions are part of the human being, both individualy and socialy (Damásio, 2003). They are a central aspect of the human behavior performing social and communicative functions, promoting or helping the social interaction (Lopes, Salovey *et al.*, 2005). Emotions came and go: they can be so short as a few seconds, or last for minutes or even an hour; in the case of lasting for a whole day, then they would be named mood instead (Ekman & Goleman, 2008).

Seemingly involuntary (Castelar, 2006), emotions are always about something in life. They have an adaptive role, alerting us to significant changes, to new directions and goals. They may not make our life easier, but they, certainly enrich their meaning and increase our wisdom towards life. Those emotions are the ones that give life pretty much of its meaning (Greenberg, 2008). However, a strong emotion can make people vulnerable

and takes control of the behavior (Fisher & Shapiro, 2006). Understanding them, means understanding choices and wishes (Strayer, 2002).

Some authors (Beer, Knight *et al.*, 2006; Damásio, 2000; Davidson, Jackson *et al.*, 2000) suggest that emotions are particularly useful in decision-making. Although it is the reason that guide us, the emotions are what drives us to act (Greenberg, 2008). People can not make a decision without affective appraisal, which tend to precede the cognitive decision (Veenhoven, 2012b). Emotions can both facilitate decisions (Davidson, Jackson *et al.*, 2000) or interfere with negotiations and relationships (Fisher & Shapiro, 2006). Decisions are mostly led by emotions and instincts; only later they could be rationalized by conscious thoughts (Sachs, 2012; "World happiness report ", 2012). Moral judgments are a result of the combination of emotion and reason (Ugazio, Lamm *et al.*, 2012). It is important to recognize that emotions are not a by-product of cognition. They may precede, follow, influence or being influenced by cognition, contributing to our balance or unbalance (Strayer, 2002). Emotion can even positively contribute to cognition and thought (Murphy, 2006), and has large influence on learning and memory (Davidson, Jackson *et al.*, 2000).

Every emotion can be useful, especially the negative ones which invite people to make changes. They are important in guiding, informing and pushing individuals to act (Strayer, 2002). It really seems that inhibiting the expression of emotions may weaken the immune system and affect the health condition (Greenberg, 2008), because even a suppressed emotion can keep affecting the body (Fisher & Shapiro, 2006; Leite & Uva, 2010).

Nowadays, it remains being as important, as it was two thousand years ago, to distinguish adaptive emotions from those maladaptive. Even

Aristoteles on his time used to consider that emotions would be adaptive if they had their origin in right things, were expressed in the right way, in the right time, and during a right period of time. On the other hand, they would be maladaptive if they happened with regard to wrong things, being expressed in a wrong way or happened in the wrong time or during the wrong period of time. So, Aristoteles recommended moderation on emotions (Rottenberg & Gross, 2003).

To Frijda (Gross & Thompson, 2007), emotions not only make us feel something, but also push us to act in the imperative form, sometimes driving the person to interrupt that moment activity - characteristic to which Fridja named “control precedence”. These pulses to act, in a certain and specific manner, are correlated with changes in the neuroendocrine system which anticipate behavioral response associated, and allow a metabolic support for action (Gross & Thompson, 2007).

The "appraisal theory" of emotions supports that it is the way a person interprets the situation, rather than the situation itself, which causes one or other emotion. According to Ortony (Siemer, Mauss *et al.*, 2007), the appraisal influences the intensity of emotion and determines its quality. For the same situation, people respond with different emotions (Barret, Gross *et al.*, 2001), depending on how they feel (Siemer, Mauss *et al.*, 2007).

Every emotion can moderate other emotions (Strayer, 2002), can be contagious (Fisher & Shapiro, 2006; Fredrickson, 2004; Lopes, Salovey *et al.*, 2005; Shteynberg, Hirsh *et al.*, 2014) and have effects on the way we live throughout our existence (Strayer, 2002), motivating the best and the worst of our actions (Ekman & Goleman, 2008).If strong and negative they can overwhelm the capacity to clearly think (Fisher & Shapiro, 2006).

Last years both cognitive and neurosciences embrasse the sudy of emotions making it a top ten topic of investigation (Damásio, 2000). Over the last decades of research, new theories and new methods have been developed; new data is now available to realize how are emotions, health and disease correlated (Rottenberg & Gross, 2003).

Although, affective experiences might be complex and multifaceted (Riediger, Wrzus *et al.*, 2014), the basic emotions are universal and recognized in the facial expression and neuro images, worldwide (Veenhoven, 2012b) seeming to exist an universal pattern. However, each person (or being, because emotions are not unique to humans) has his/ her emotional profile (Ekman & Goleman, 2008).

Neurobiology of Emotions

Neurobiological processes are quite complicated (Damásio, 2010). Even neurobiology is a successful issue, the current knowledge about the human brain is still incomplete (Damásio, 2010).

Acording to Breedlove *et al.*, James Papez proposed in 1937, the designation and identification of a neuronal circuit of emotions, "the Papez circuit", including the mammillary bodies of the hypothalamus, the anterior thalamus, the cingulate cortex, the hippocampus and the fornix (Breedlove, Rosenzweig *et al.*, 2007).

Recently (Panksepp, 1998) has been confirmed the importance of the cingulate cortex in the development of certain emotions. But, the other areas

described in the concept of Papez are not considered today as essential in emotional system.

Later, the Papez circuit has been extended, with the inclusion of the amygdala and several other interconnect areas and the name "limbic system". has been proposed to refer to the complete system (Breedlove, Rosenzweig *et al.*, 2007). The limbic system includes portions of the hypothalamus, thalamus and cerebral cortex, besides several deep brain nucleuses, being the most prominent the amygdala and the hippocampus (Lundy-Ekman, 2008).

The limbic system is involved in emotions and in the processing of certain types of memories (Lundy-Ekman, 2008). So, the occurrence of injuries in the limbic system has deep effects on the emotional receptiveness (Barker, Barasi *et al.*, 2003).

Currently, many neurologists disagree with the concept of the limbic system as a distinct anatomical and functional entity; however, the majority agree in considering those areas as essential substrates to emotionality (Panksepp, 1998).

According to Breedlove, (Breedlove, Rosenzweig *et al.*, 2007), Damásio underscored the insula, the cingulate cortex and the prefrontal cortex among the most activated brain areas in the stimulation of emotions. When, on the contrary, it is a case of anhedonia (loss of pleasure or interest), depressed individuals failed to maintain over time the activity of the nucleus accumbens (Heller, Johnstone *et al.*, 2009), which is generally associated with positive affect and reward (Davidson & Schuyler, 2015).

Brain is the central organ for the stress response (Mcewen, 2007; Shonkoff, Boyce *et al.*, 2009), and the amygdala is one of the most important

limbic structures involved in stress and anxiety states (Holzel, Carmody *et al.*, 2010).

The amygdala, a small almond-shaped structure, located in the middle part of the temporal lobe, is correlated with learning and storing of the experience emotional aspects (Barker, Barasi *et al.*, 2003); it is important in detecting threat and negative emotions and on expressing compassion (Davidson, 2011). It is essential for stress response, in the case of the detection of stressful or threatening stimulus and also, on the initiation of a adaptive response (Holzel, Carmody *et al.*, 2010). The amygdala is the link between inputs from hippocampus, thalamus and neocortex and outputs to the autonomic nervous system (Argyle, 2001). Different parts of the brain work together in the emotional circuit; the amygdala and ventral striatum are interconnected with the prefrontal cortex and are in communication with the body, namely with the endocrine, the immune systems and the autonomic nervous system, leading to a inevitable reciprocal influence between brain and body (Davidson, 2011). The affective reactivity of the amygdala can be measured and studed by functional magnetic ressonanace images (fMR)(Davidson, Jackson *et al.*, 2000).

As the amygdala is closely involved in the emotional process (Davidson, Jackson *et al.*, 2000; Disner, Beevers *et al.*, 2011), if damage occurs in it, it will cause changes in emotional reactions and behavior. For example, amygdala injuries may be followed by the inability to recognize facial expressions of fear (Barker, Barasi *et al.*, 2003). Anxiety has been associated to an overactive amygdala (Davidson & Mcewen, 2012). Acording to Damásio the amygdala is essential for the recognization of fear on facial expressions, but has nothing to do with sadness or happiness (Damásio, 2000).

The amygdala plays a key role, especially in negative emotions such as fear (Davidson, Jackson *et al.*, 2000; Fernández-Abascal, 2009b), but also, and generally speaking, in emotional memory, appearing to be involved in the recall of positive affect associated with stimuli. Beyond its role in processing emotions, the amygdala is related to the perception of emotions and memory of emotional stimuli (Fernández-Abascal, 2009b). It seems to be specialized in the rapid detection of emotionally relevant stimuli, acting automatically, regardless the control of cognition and consciousness (Vuilleumier, Armony *et al.*, 2001), as if its role was to determine the urgent need of the stimulus (Storbeck & Clore, 2007). MacLean accurately identified the amygdala as an important part and component of what he called the emotional brain (Panksepp, 1998).

LeDoux also emphasized the importance of the amygdala (Ledoux, 2000) by its role in the emotional meaning of stimuli calling it the "emotional computer" (Eysenck & Keane, 2000), as well as other authors have done (Argyle, 2001). The amygdala, for its role in the recognition of emotions, plays an important role in our interaction with society (Lundy-Ekman, 2008).

Each emotion involves the activity of more than one area of the brain, but some brain areas are involved in more than one emotion (Breedlove, Rosenzweig *et al.*, 2007).

The brain is the main organ of stress and adaptability; therefore it is both vulnerable and adaptable. Brain interprets and regulates behavioral, neuroendocrine, autonomic and immunological responses. Significant adversities can induce brain changes, structural and functional, being the hippocampus, the amygdala and the prefrontal cortex the most related areas (Shonkoff, Boyce *et al.*, 2009). On the other side, positivity can promote the

continued activation of ventral striatum and dorsolateral prefrontal cortex, predicting sustained happiness and better psychological and physical well-being (Davidson & Schuyler, 2015). The left anterior cortex is activated when people are happy, whereas the right cortex is activated with negative emotions (Argyle, 2001).

The ventromedial prefrontal cortex is associated to emotion regulation and decision making (Davidson, 2011). Through life, stress and their related hormones bring out both adaptive and maladaptive effects on the brain (Mcewen, 2007).

The immune system and the nervous system interact deeply with the endocrine system in a mutual relationship (Breedlove, Rosenzweig *et al.*, 2007; Glaser & Kiecolt-Glaser, 2005). Stress, for example, increases the levels of various hormones such as cortisol, adrenaline and noradrenaline and suppresses other hormones such as testosterone (Breedlove, Rosenzweig *et al.*, 2007). Stress can induce immune alterations, giving rise to health changes, increasing susceptibility to infections, reactivating latent herperviruses, increasing progression of HIV, delaying wound healing and inducing the production of cytokines which are related to age diseases (Glaser & Kiecolt-Glaser, 2005).

The brain affects the immune system through the fibbers of the autonomic nervous system that innervate the immune system organs, such as the thymus and the spleen. These noradrenergic fibers are axons post ganglionic of the sympathetic system and affect antibody production and immune cell proliferation (Breedlove, Rosenzweig *et al.*, 2007).

The cerebral hemispheres work differently in the recognition and processing of emotional stimuli: the right hemisphere interprets the best

stimuli and emotional states (Breedlove, Rosenzweig *et al.*, 2007), and the left hemisphere is specialized in cognitive processing (Fernández-Abascal, 2009b).

For many years, it was thought that emotion and reason, even associated, had separate brain systems: emotion was associate with the subcortical structures, whereas reason was associated with the cerebral cortex. However, the progress of neuroimaging techniques during the last two decades, allow to understand the interaction between cortical and subcortical areas and study both the structure and the function of the human brain (Davidson & Schuyler, 2015). As an example, the dorsolateral prefrontal cortex -*a* region often involved in attention and working memory- is found to be active also when people is regulating their emotions (Davidson & Schuyler, 2015).

Men and women process the emotions differently: women are emotionally more expressive and, when emotionally stimulated, respond psycho and physiologically strongly than men (Fernández-Abascal, 2009b).

Women, who anatomically have a greater volume of gray matter in the cingulate cortex (part of the limbic system), activate more often the limbic structures of the middle line, such as the previous subcallosum cingulum, thalamus, midbrain and cerebellum. Men, on the other hand, show a greater involvement of the inferior frontal cortex and posterior structures. These differences might be related to emotional expression or independent responses to emotional stimuli (Fernández-Abascal, 2009b).

The hypothalamus, besides other functions, regulates the expression of emotions (Lundy-Ekman, 2008).

Human brain has a system of negative and positive affect (Grinde, 2012) as well as have different neural circuits for well-being and ill-being (Ryff, Love *et al.*, 2006). The disruption on neurogenesis or on synaptic plasticity may lead to psychiatric diseases (O'connor, Dinan *et al.*, 2012). Neurogenesis can be promoted by exercise (Davidson, 2011).and impaired by stress (Davidson, 2011; Sapolsky, 2011).

Although the relationship between physical health and psychology has been widely documented, the knowledge about what really happens within the cellular level is not yet well understood (Jacobs, Epel *et al.*, 2010).

A growing number of studies link shorter telomere length and lower telomerase activity with several diseases, at great risk for cardiovascular diseases, and premature mortality (Lin, Epel *et al.*, 2010; Sibille, Langaee *et al.*, 2012).

Telomeres are protective DNA sequences at the end of the chromossomes to ensure the genomic stability during the cellular replication (Jacobs, Epel *et al.*, 2010; Ricard, 2013).

Telomere shortening are like a mitotic clock (Lin, Epel *et al.*, 2010), an indicator of the biologic age of a cell, predicting physical health and longevity (Jacobs, Epel *et al.*, 2010).

Telomerase activity, firstly reported in blood cells in 1995, and telomere length are biomarkers for the age related diseases (Lin, Epel *et al.*, 2010).

Beyond that, as telomere length are related (inversely) to perceived stress (Glaser & Kiecolt-Glaser, 2005; Jacobs, Epel *et al.*, 2010), it has been proposed to name them as "psychobiomarker"(Jacobs, Epel *et al.*, 2010).

Both shortened telomere length and lower telomerase activity are associated with stress, predicting health risks and some diseases; they may

be, in part, regulated by stress and well-being (Jacobs, Epel *et al.*, 2010). Suffering is related to telomeres shortening (Kabat-Zinn, 2011). The shortest telomeres were observed in the presence of chronic pain and high stress (Sibille, Langaee *et al.*, 2012). On the contrary, changing lifestyle by reducing stress may increase by about 30% of the telomerase activity (Ricard, 2013). For instance, it has ben reported that participants on a yoga and meditation retreat had significantly higher telomerase activity (Jacobs, Epel *et al.*, 2010).

One cannot speak of neurobiology without addressing, even briefly, the "mirror neuron system", which acts in processing emotions and allows us to understand and experience the emotional states of others, creating a bridge between ourselves and those around us (Fernández-Abascal, 2009b).

Emotional fluctuation

Extreme emotional states (no matters if they are positive or negative) are maladaptive (Gruber, Kogan *et al.*, 2013). High emotional variability in a relatively short time, even if they are positive emotions, is associated to worse psychological health, increased levels of depression and anxiety, decreased levels on satisfaction with life and subjective happiness (Gruber, Kogan *et al.*, 2013).

Even the intensity of evoked emotions gradually decreases over time (Schulreich, Heussen *et al.*, 2014), individuals with strongly negative emotions need to relieve them to be able to enjoy the benefits from positive emotions (Cohn, Brown *et al.*, 2009).

Negative emotions narrow the range of attention (Fredrickson & Branigan, 2005), cognition (Catalino & Fredrickson, 2011), and behavior (Robinson, Kennedy *et al.*, 2012). They are associated with poor quality of life, with increased mortality and morbidity (Nave-Leal, Pais-Ribeiro *et al.*, 2012), and are related to the risk of different psychological disorders (Gruber, Mauss *et al.*, 2011).

Negative affect may reduce conscientiousness, which is related to mental health problems such as anxiety and depression (Javaras, Schaefer *et al.*, 2012).

From an evolutionary perspective, negative emotions, like anxiety and anger, which express a state of threat or loss, are associated with the adaptive evolutionary way of act as “fight or flight” (Vie, Glaso *et al.*, 2012). However, some negative emotions such as anger has risks for health, namely on cardiovascular diseases and blood pressure (Rosenberg, Ekman *et al.*, 2001).

Fredrickson’s broaden-and-build theory state that whereas negative emotions narrow people’s attention and cognition, positive emotions, on the contrary, broaden attention and thinking (Catalino & Fredrickson, 2011; Fredrickson, 1998, 2010).

When a person experiences negative emotions, life satisfaction will not be reduced if high level of negative emotions do not become pathologically intense or chronic (Cohn, Brown *et al.*, 2009).

Emotional Regulation

Emotions can either hurt or help us (Gross, 2008). Nowadays, is increasingly evident that emotional experiences are related to changes in health and disease states (Kemeny & Shestyuk, 2008).

Emotion regulation is the process by which people modify their emotions, consciously or unconsciously (Gruber, Eidelman *et al.*, 2011). It is associated with better health and well-being and with improved strategies for coping with stress (Kang & Gruber, 2013).

Flexible and adaptive emotion regulatory capacities are considered right tools to increase happiness and well-being (Gruber, Mauss *et al.*, 2011).

The concern with emotional regulation is not a modern process (Gross, 2008). Self-regulation strategies are considered essential to repair the states of negative mood, to create and maintain the positive mood and to ensure proper functioning when you need or want (Kashdan, 2007).

Self-regulation can fail by: a) down regulation, when there is not enough control over yourself or by b) deregulation, understood as the use of an ineffective strategy for controlling the impulse (Gallo, Mcculloch *et al.*, 2009).

Coping with stress and NA requires self-control; however people just have limited ability to control and change their behavior (Grinde, 2005). People with high self-control trait are more successful in life and may experience greater life satisfaction and happiness (Cheung, Gillebaart *et al.*, 2014).

The regulation of performance related to emotions is the process to initiate, sustain, modulate or change the occurrence, the shape and the duration of the behavioral aspects of emotion (Batum & Yagmurlu, 2007). As

any complex psychological phenomenon, it may occur in various ways (Zelazo & Cunningham, 2007).

Emotions have some flexibility (Gross, 2008). Gross & Thompson (2007), underscoring William James, whom had already emphasized in 1884, that emotions are responses that could be modulated in various ways, it is possible to intercede in one or more points of the emotions generating process using strategies that can restrain them, intensify them or simply keep them, depending on each personal goals.

People differ from each other in their ability to regulate their emotions (Lopes, Salovey *et al.*, 2005), but a general deficit in emotional regulation is associated with various forms of psychopathology as depression, anxiety, substance abuse, eating disorders, attention disorders, and borderline personality disorders (Berking, Orth *et al.*, 2008).

As psychological problems are not the result of thoughts or unwanted feelings, but rather the result of attempts to suppress, avoid and control them (Sloan, 2004), the ability to cope well with negative emotions is recognized as essential to the integrity of mental health (Berking, Orth *et al.*, 2008).

Furthermore, emotion regulation is very important to the success of social interactions and for the maintenance and regulation of relationships among people, contributing to inter-cultural adjustment (Matsumoto, Yoo *et al.*, 2008).

Inappropriate emotional responses are involved in and are correlated with psychopathology (Gross, 2008), social disability and may be expressed as a physical illness. For Gross & Thompson (2007), our ability to successfully regulate our emotion is crucial, because too much variability, even if in

positive feeling, may have unhealthy psychological consequences (Gruber, Kogan *et al.*, 2013).

The emotional regulation process is an on-going process of changes that develops itself throughout life and in line with individual personality (Gross & Thompson, 2007); it can be automatic or controlled, conscious or unconscious (Rottenberg & Gross, 2003).

The emotional regulation may act through cognitive processes, of expression, behavioral and physiological (Lopes, Salovey *et al.*, 2005). Any of the various ways to regulate emotions has always a cognitive cost. As long as cognitive re-evaluation has a lower cost, suppression has a greater involvement of cognitive processes (Richards & Gross, 2000).

Positive emotions involve a lower cognitive effort in the analysis of information, improving performance; negative emotions reduce processing abilities, decreasing the efficiency of certain tasks (Sánchez & Sánchez, 2009). However, not all negative emotions require regulation. Individuals who know how to distinguish and regulate their emotions prove to be more emotionally intelligent (Barret, Gross *et al.*, 2001).

Over the past 20 years, the attachment theory of Bowlby has become of greater influence in the understanding of emotional regulation (Shaver & Mikulincer, 2007).

According to this theory (Shaver & Mikulincer, 2007) the attachment created, specially in childhood and adolescence, with the closest figures includes a variety of cognitive, affective and behavioral strategies, that can change, block or delete the appearance, activation and expression of emotions. These strategies lead the process of emotional regulation

modulating the evaluation, feelings and behaviors (Shaver & Mikulincer, 2007).

The onset of emotions happens by the perception of changes in the surrounding world; especially if they are sudden, unexpected or significant to the person (Shaver & Mikulincer, 2007). These changes are automatic and often unconscious; are felt, being perceived and valued in accordance with the needs, goals, the will and concerns of each person.

The emotions depend from the specific pattern of concern and appraisal that was activated. If changes are adverse, the emotional result is negative (Shaver & Mikulincer, 2007). A specific appraisal is automatically followed by the corresponding emotion with the functional and physiological aspects as changes in breathing, blood pressure and muscle tension (Shaver & Mikulincer, 2007). These consequences can be expressed verbally, or in thoughts, feelings or actions and are measurable in various ways (Shaver & Mikulincer, 2007).

These diverse patterns of emotion and defense have been documented in a remarkable number of studies and are now being further developed with the study of neuroscience (Shaver & Mikulincer, 2007).

Recent discoveries in this field lead to a new understanding of the brain structural plasticity (Mcewen & Milner, 2007), as brain it is neither static or immutable; it is continualy being remodeled by each person's experiences of living (Davidson & Begley, 2013).

Neuroscience moved forward by recognizing the importance of remodeling the brain throughout lifespan by physical activity, and both physical or psychotherapy (Mcewen & Milner, 2007).

Throughout life physical activity has a strong impact not only in body but also in brain development, structure and functions (Mcewen, 2007).

Voluntary physical activity increases neurotrophin - in cortex and hippocampus areas, and neurogenesis - in the dentate gyrus (Mcewen, 2007). The hippocampus has been associated with the capacity to learn new skills (Ricard, 2013).

Emotional Regulation Strategies

According to Gross (Gallo, Mcculloch *et al.*, 2009; Watson & Sinha, 2008), emotional self-regulation is a process by which each person may have influence on the kind of emotions, as well as, on the moment and the way one experienced and expresses them.

Although emotional regulation has been a subject of study long ago (Gross, 2008), it has raised more doubts and questions than answers (Gross & Thompson, 2007).

Emotions can be regulated in several ways (Richard, Butler *et al.*, 2003), but never turned on and off like a light switch (Fisher & Shapiro, 2006). Shaver *et al.* argues that regulatory efforts can change the whole process of emotions (Shaver & Mikulincer, 2007).

The way people regulate their emotions affect their relationships, their well-being and the stress they feel (Lopes, Salovey *et al.*, 2005). In addition to the social context, the family has a great importance and an essential and multi-faceted influence on the emotional development (Thompson & Meyers,

2007). It is during childhood and adolescence that emotion regulation suffers further development (Gross & Thompson, 2007).

It is important to promote on students feelings of competence and control so that they develop themselves as healthy, adaptive and constructive individuals (Seifert, 2004).

Because emotions are a process with several components that blossom and change over time, the emotional regulation is, itself, a dynamic process in duration, magnitude and onset of answers either in behavioral field, either in its physiological expression (Gross & Thompson, 2007).

One of the challenges of the emotions regulation is to find a conceptual framework that helps to organize the multiple different ways to regulate emotions. One of the processes proposed by Gross (Gross & Thompson, 2007) is to specify a sequence of five procedures involved wherein each of them is itself a target for regulation (Jonh & Gross, 2007).

These five points which Gross developed by his modal model (Gross, 2008), of emotional regulation are: (i) the choice of the situation; (ii) the change in the situation; (iii) the redirection of the attention (iv) the cognitive reassessment; (v) and the modulation, or smoothing the response.

The choice of the situation (i) often requires the perspective of others, such as parents, friends or a therapist. This form of extrinsic regulation is important not only throughout life, but especially in childhood, demanding, sometimes a run of the emotional climate of family life. The change in the situation (ii) is a powerful way of regulating emotion. Redirecting attention (iii) is one of the first processes of emotional regulation to appear in development. It is used from childhood to adulthood, particularly when you cannot change or modify the situation. It has two main strategies that are distraction and

concentration. Cognitive reappraisal (iv) refers to the change or the way you think about a situation, or the ability to deal with the demands that it brings to us. Changing their meaning will change, therefore, the impact it causes on us. The modulation of the response (v), unlike the other processes, occurs later, after the response trend had already started (Gross, 2008).

For Gross, the individual can have a considerable control over his/her own emotions, using a range of strategies that can have an impact on the kind of emotions experienced and the moment they occur (Gross & John, 2003). The author studied in detail two regulatory strategies of the emotions: cognitive reappraisal and reassessment of the response focused on suppression (Gross & John, 2003).

The cognitive reappraisal, is about changing the way people think about an event, in order to change their emotional impact (John & Gross, 2004).

Reappraisal, often helps people in decreasing their negative emotion (Ng & Diener, 2013).

The deletion is a regular process in social interactions. It is the process of deliberately to inhibit the expression of emotions when they are activated (Richard, Butler *et al.*, 2003).

While reappraisal is a focused strategy before the emotion (and the consequent behavioral and physiological change), the deletion is cited as a response after the emotion has taken place (Gross & John, 2003) and implies reducing the behavioral expression once already installed emotion (John & Gross, 2004).

The reappraisal implies rethinking the meaning of the emotional load of the stimulus or event, in order to change their emotional impact (Ochsner &

Gross, 2008). So, it can change the intensity of an emotion but also help in emotional regulation (Siemer, Mauss *et al.*, 2007).

On the other hand, the suppression is an emotional regulation strategy focused on response. The suppression seems to have negative cognitive effects (Gallo, Mcculloch *et al.*, 2009), with memory impairment and other side effects (Gallo, Mcculloch *et al.*, 2009; Gross, Sutton *et al.*, 1998). It creates sometimes a sense of inconsistency between what you feel and what is expressed, which can lead to alienation (Gross & John, 2003).

There are several evidences suggesting important connections between the suppression of the emotional expression, social relationships and health (Butler, Egloff *et al.*, 2003).

The regular use of suppression, which seems to be a counterproductive method of thoughts control (Luciano & Algaravio, 2008), is associated to a unhealthy general pattern, lack of social support and depressive symptoms (Gross & Thompson, 2007). People who often use it, feel more negative emotions, experience and express less positive emotions and have lower levels of well-being, satisfaction with life (John & Gross, 2004) and self-esteem (Gross & John, 2003). They tend to evaluate their emotions in negative terms, underestimating their ability to regulate their emotions and tending to ruminate (Gross & John, 2003).

Rumination is the cognitive process of focus on repetitive content and consequences of own affective state, adopting a first person perspective in a not conducive problem solving (Gruber, Harvey *et al.*, 2009). This ability to sustain psychological stress beyond events, such as ruminating over the past and worrying about the future, have been associated to cortisol release (Jacobs, Shaver *et al.*, 2013) The attention repeatedly focused on yourself

with negative thoughts or anger, maintains or amplifies the emotional response and is associated with several negative consequences such as high levels of negative emotions, intrusive thoughts (Ray, Wilhelm *et al.*, 2008), depressions and increased cardiovascular reactivity (Watson & Sinha, 2008). The negative automatic thoughts could be the initiating mechanism of dysfunctional behavior (Swart & Apsche, 2014).

Rumination has adverse outcomes. It interferes with concentration (Lyubomirsky, Sousa *et al.*, 2006) and it is also associated with poor health, reduced satisfaction, confidence and happiness, and social relationships (Miron-Shatz, Diener *et al.*, 2013).

Rumination about negative emotions has been consistently related not only with on the maintenance of depression (Disner, Beevers *et al.*, 2011; Gruber, Eidelman *et al.*, 2011), but also with the process to initiate it (Disner, Beevers *et al.*, 2011). Furthermore, anxious and depressed individuals ruminate more about their negative emotions (Disner, Beevers *et al.*, 2011; Jonh & Gross, 2007). When ruminating, people are out of control with negative thought and feelings (Kang & Gruber, 2013), away from the present having anxieties or fantasies with the future and absorptions about the past (Brown & Ryan, 2003).

The process of rumination involves several neural structures such as the amygdala, the hippocampus and the prefrontal cortex (Disner, Beevers *et al.*, 2011)

The psychological stress caused by rumination has adverse effects not only on psychological health but also on aging (Jacobs, Shaver *et al.*, 2013).

The two mentioned strategies of emotional regulation have very different consequences on physical and mental health; suppression is considered to be more disruptive in social interaction, relationships and social support when comparing to cognitive reappraisal (John & Gross, 2004).

People with cardiovascular diseases, and who experience high levels of negative emotions, have four times more likely to die from cardiovascular diseases if they use suppression as a method to regulate emotions in their social experiences (John & Gross, 2004).

The use of cognitive reappraisal instead of suppression is a pattern of healthier emotional regulation (John & Gross, 2004), resulting in higher levels of satisfaction and well-being, better social relationships, greater self - esteem and fewer depressive symptoms (Gross & John, 2003).

The regulation of physiological component of emotions can also be attempted with the help of medications (such as anxiolytics or beta blockers), physical exercise and relaxation techniques. Sometimes, people resort to the ingestion of food or other drugs such as tobacco and alcohol. This regulation has a lot to do with the cultural context that is crucial for everyone, whatever his/her age (Gross & Thompson, 2007). As a matter of fact the results in what concerns the relationship between age and emotional regulation blend: some aging theories predict greater emotional complexity as age advance (Scott, Sliwinski *et al.*, 2014); some authors associate age with improved emotion regulation and some others found no differences on emotion regulation capacities related to age (Reekum, Schaefer *et al.*, 2011).

To Lopes *et al.*, emotional regulation is an area in which, like mathematics, you need the knowledge and practice for a good performance (Lopes, Salovey *et al.*, 2005).

STRESS

The word stress is used to describe those experiences that are emotionally and physiologically challenging (Mcewen, 2007)

Stress is not just a stimulus or a response to it (Yusoff, 2011): it is a complex phenomenon (Costa, 2011); it is a process in which people perceive and cope with environmental challenges and threats (Yusoff, 2011).

Stress is a multidimensional concept, which includes not only the stress stimulus but also the collected responses and all their cognitive processing (Sapolsky, 2007). Thus, it must have a global approach focused on a psycho-neuro-endocrine-immune vision (Fernández-Abascal, 2009a).

Stress became known by Hans Selye who studied it for almost 40 years. Selye described the impact of stress in each of body organs and systems, emphasizing mainly the connection between stress and health (Breedlove, Rosenzweig *et al.*, 2007).

Selye developed the concept of "General Adaptation Syndrome", according to which the stress response can have three stages: the initial (i), which is the "alarm reaction"; the second (ii), named "the state of adaptation" including the successive activation of the appropriate response and restoring of the homeostatic balance and thirdly (iii), the "exhaustion stage". Characterized by an increased susceptibility to disease, this stage settles when stress keeps going or is frequently (Breedlove, Rosenzweig *et al.*, 2007).

In spite of stress had been studied for more than one hundred years (Sapolsky, 2007), only in the late fifties from the last century has been clarified the importance from psychological factors in some stress related diseases (Sapolsky, 2007).

In general, psychological stress has a negative impact on the immune system and health (Leite & Uva, 2010; Nair, Sagar *et al.*, 2014; Sapolsky, 2011; Sheridan, 2011), being a risk factor for high blood pressure, cardiovascular disease (Block, He *et al.*, 2009; Sheps, 2011) and cancer (Block, He *et al.*, 2009).

There is increasing evidence of the relation between stress and both cardiovascular and neuro-endocrine diseases, with the onset and development of coronary related diseases, and with cholesterol levels and protein mediators of the inflammation process (Kemeny & Shestyuk, 2008).

The immune system and the nervous system interact deeply with the endocrine system, resulting in reciprocal reactions between them (Breedlove, Rosenzweig *et al.*, 2007; Sheridan, 2011). Stress increases some hormone levels such as cortisol, adrenaline and noradrenaline, and suppresses some others as testosterone (Breedlove, Rosenzweig *et al.*, 2007).

The European Foundation estimates that at least half premature deaths are related to life-style-related diseases (Pozos-Radillo, Lopez *et al.*, 2008), which highlights the strong relationship between experienced stress and physical health (Gorter, Eijkman *et al.*, 2000; Holmgren, Fjällström-Lundgren *et al.*, 2013; Nair, Sagar *et al.*, 2014). The INTERHEART study, developed in fifty- two countries found that psychological stress is responsible for almost 40% of the risk of myocardial infarction, both for men and women (Sheps, 2011).

The following symptoms, as a result of stress, can separately or simultaneously appear:

a) Psychosomatic disorders such as: palpitations, frequent migraines, chronic fatigue, insomnia, ulcers, cervical pain/neck pain, hypertension, allergies, gastrointestinal disorders and changes in menstrual period;

b) Behavior disorders such as: absenteeism, rapid mood swings, irritability, increased aggressiveness, social withdrawal, increased consumption of drugs or alcohol and memory lapses;

c) Emotional disorders: impatience, anxiety, feelings of isolation, focus difficulties, emotional detachment, low work performance, feeling of powerlessness and depression (Fernández-Abascal, 2009a);

d) Physical disorders: pain related to the musculoskeletal system, especially in the neck, shoulders and lower back (Palliser, Firth *et al.*, 2005).

Stress leads to depression (Ledoux, 2000; Nair, Sagar *et al.*, 2014), and it is one of the major predisposing factors for anxiety and mood disorders (O'connor, Dinan *et al.*, 2012). The stress-related illnesses are one of the causes for the early retirement of dentists (Newton, Allen *et al.*, 2006).

Stress, as unbalance between what is required and the capacity of each person (Ayers, Thomson *et al.*, 2008), is recognized as being related to depression, absenteeism, chronic diseases and mortality levels (Tabak & Koprak, 2007).

In medical practice, both stress and tension, in addition to interfering with the clinical performance and the quality of medical appointments, they also have an impact on the doctor's family and personal life (Swanson & Power, 1999).

Stress levels have been shown to be directly related to the levels of job dissatisfaction (Newton, Allen *et al.*, 2006; Tabak & Koprak, 2007), work accidents (Tabak & Koprak, 2007), and poor relationship between co-workers

(Newton, Allen *et al.*, 2006). Professional stress is considered as a serious problem with harmful consequences; not only to a personal level such as health and safety but also towards to employers, such as costs of absenteeism and health employees expenses (Lim & Yuen, 1998).

Occupational stress resulting from both excessive job demands and few resources causes a state of physical and mental tension that in chronic or extreme circumstances in a susceptible individual, may precipitate the development of burnout (Humphris, Blinkhorn *et al.*, 2002).

As job dissatisfaction and stress at work are strongly related with the desire of retirement (Newton, Luce *et al.*, 2004), job satisfaction is a protective factor against stress and depersonalization (Rutter, Herzberg *et al.*, 2002).

Studies relating gender with stress levels are different from one author to another: some report that women do not have higher levels of stress than males (Taskaya-Yilmaz, Ceylan *et al.*, 2004), and some others report women as having higher levels of stress, in several domains such as family (Block, He *et al.*, 2009).

Stress and neurology

Stress may change hippocampus, which is a malleable structure (Ledoux, 2000; Mcewen, 2007; Mcewen & Milner, 2007) and its memory functions (Ledoux, 2000). If stress becomes chronic or occurs in early life, it can lead to pathological changes in the brain with consequent damages on behavior and on physiological responses (O'connor, Dinan *et al.*, 2012). Early life stress modulates the hypothalamic-pituitary-adrenal axis (mainly on

cortisol levels) with complexes consequences, which are dependent from the chronicity and timing of stress (Davidson & Mcewen, 2012).

Stress, being acute or chronic, can alter spine density and dendritic length and branching in certain brain regions such as hippocampus, prefrontal cortex and amygdala (Davidson & Mcewen, 2012).

Acute and repeated stress causes structural and functional changes in in the brain in some regions such as prefrontal cortex and amygdala (Mcewen, 2007).

There is a correlation between stress and changes in the structure of the amygdala (Holzel, Carmody *et al.*, 2010), specially morphometric changes in the right (but not in the left) amygdala (Holzel, Carmody *et al.*, 2010). Chronic stress stimulate amygdala to work, which leads people to feelling more fear and anxiety; it will inhibit the neurogenesis and the release of dopamine and also impare the frontal cortex to make decisions and control emotions (Sapolsky, 2011).

Chronic Stress

The experienced stress is determined by the interaction between what happens around the individual, his personal characteristics and the coping strategies they use (Palliser, Firth *et al.*, 2005).

Stress answers are highly adaptive. In spite of being related to some health problems, stress, by itself, does not inevitably leads to dysfunction or disease (Breedlove, Rosenzweig *et al.*, 2007). Besides, not all stressors are equal. Whereas some have negative consequences, others may have positive

consequences, depending on the way people experience them (Sheridan, 2011).

While acute stress may enhance the immune system, chronic stress tends to suppress immunity (Sheridan, 2011), making people to be more vulnerable to infectious disease (Sapolsky, 2011).

Chronic stress is the one that causes an increased risk of cerebrovascular diseases, affects the process of wound healing, increases the risk of developing ulcers, and may interfere with fertility in both sexes (Sapolsky, 2007). It is also chronic stress that may lead to burnout (Neidle, 1984). Burnout, which is highly prevalent among health professionals (Mccray, Cronholm *et al.*, 2008), is characterized by the loss of emotional, mental and physical energy due to prolonged job related stress (Gorter, Eijkman *et al.*, 2000; Mccray, Cronholm *et al.*, 2008).

Chronic stress is a high risk for many diseases (Sapolsky, 2011). Experiencing stress for a long time may lead people to harmful consequences in physical health, in emotional balance and in social and professional life (Gorter, Albrecht *et al.*, 1999), It may cause professional dissatisfaction and difficulties in the relationships between colleagues (Ayers, Thomson *et al.*, 2008). Over working and stress caused by social relationships at work result in distress, emotional exhaustion and depersonalization (Lert, Chastang *et al.*, 2001).

The mechanism for the effect of repeated stress is not known yet (Mcewen, 2007). But chronic stress causes changes in the brain (Mcewen, 2007) and may be associated to premature aging of immune cells -which will accelerate the risk of developing many age related diseases (Glaser & Kiecolt-Glaser, 2005).

Many chronic stressors (and also certain types of acute stress) suppress neurogenesis in the dentate gyrus (Mcewen, 2007).

Perceived stress has a significant negative correlation with emotional intelligence; it appears that emotional intelligence is a moderator of stress (Birks & Watt, 2007).

Stress and MSDs

Musculoskeletal pain can be related to burnout and stress (Langballe, Innstrand *et al.*, 2009)

The professional stress experienced, encountered in a work environment has greater impact on family life than the family stress has in the in work environment (Swanson & Power, 1999). It interferes not only with the personality traits, but also with the personal history (personal predisposition) increasing psychological distress (Lert, Chastang *et al.*, 2001). The greater the levels of psychological distress among dentists, the greater the physical symptoms (Perez-Padron, Bernabé *et al.*, 2010).

The clear relationship between professional stress and the symptoms of musculoskeletal injuries leads to the conclusion that physiological and behavioral reactions to stress may, either directly or indirectly, affect the development of signs and symptoms of those musculoskeletal injuries (Palliser, Firth *et al.*, 2005). The professional stress (Palliser, Firth *et al.*, 2005) is associated with physical and mental symptoms (Holmgren, Fjällström-Lundgren *et al.*, 2013), and with not only the presence but also the increasing prevalence of back pain (Dean, Hudson *et al.*, 2011).

One of the potential consequences of stress is job dissatisfaction (Turley, Kinirons *et al.*, 1993), and early retirement (Ayers, Thomson *et al.*, 2008; Burke, Main *et al.*, 1997). It is remarkably evident the relationship between job dissatisfaction and complaints related to musculoskeletal injuries (Rolander, Karsznia *et al.*, 2005) among dentists, especially in the lower back, neck and nape (Palliser, Firth *et al.*, 2005).

Musculoskeletal Disorders (MSDs) and stress related illness, which includes cardio vascular diseases and neurotic symptoms, are the most important causes for premature retirement (Burke, Main *et al.*, 1997).

Stress among doctors and dentists

The health sector has long been considered a high level stressful occupation for being related to difficult working conditions, to the risk of exposure to contagious diseases and, also, for having to deal with life and human suffering (Myers & Myers, 2004).

The practice of medicine (Dahlin, Joneborg *et al.*, 2007; Peisah, Latif *et al.*, 2009; Prins, Gazendam-Donofrio *et al.*, 2007; Schmitter, Liedl *et al.*, 2008) and the previous academic years (Alexander, 2001; Dahlin, Joneborg *et al.*, 2007; Goebert, Thompson *et al.*, 2009; Singh, Hankins *et al.*, 2004; Smith, Peterson *et al.*, 2007) have been described and considered for many years as sources of anxiety, depression and stress (Dyrbye, Thomas *et al.*, 2006; Goebert, Thompson *et al.*, 2009).

Distress levels in healthcare professionals have increased in recent years (Frasquilho, 2005).

Several studies show that both doctors and dentists present high stress levels, higher than the general population (Esteves, 2010; Rutter, Herzberg *et al.*, 2002; Schmitter, Liedl *et al.*, 2008).

Dentists deal with high levels of stress during their career (Alexander, 2001; Esteves, 2010; Hu, Gorenstein *et al.*, 2007; Montasem, Brown *et al.*, 2013; Newton, Allen *et al.*, 2006; Winwood & Winefield, 2004), which may compromise their physical and mental health (Alexander, 2001; Esteves, 2010; Perez-Padron, Bernabé *et al.*, 2010), their well-being and their personal relationships (Perez-Padron, Bernabé *et al.*, 2010). Depression, which is the most expensive disease in the world (Seligman, 2011b), is considered high in dentists and accompanied by personal crises, family and friends isolation and a high number of divorces (Gerschman, 1998).

General dentistry is a stressful professional group, not only for the huge number of cardiovascular diseases they suffer from, but also for their behavior towards alcohol consumption and drug addiction and for the high number of divorces and suicides (Gerschman, 1998; Myers & Myers, 2004).

The Swedish Dental Association found that due to psychological factors they are exposed to, such as stress, emotional tiredness, tension and anxiety, dentists live 10 years less than the general population (Pozos-Radillo, Lopez *et al.*, 2008).

With higher levels of blood pressure comparing to the general population (Dimatteo, Shugars *et al.*, 1993), dentists have a 25% higher prevalence of hypertension and coronary artery diseases (Gerschman, 1998).

Seven out of ten dentists die from cardiovascular diseases related to stress (Gerschman, 1998); more than a third of dentists are overweight (Myers & Myers, 2004) and 10 to 20% of American dentists are dependent on

chemical drugs such as alcohol, marijuana, amphetamines and narcotics such as heroine, morphine and pethidine (Gerschman, 1998).

According to Perez-Padron *et al.*, 57 % of dentists are great alcohol drinkers and 23% of the dentists suffer from distress (Perez-Padron, Bernabé *et al.*, 2010)- a broad term that encompasses mental health disorders as anxiety, depression and burnout (Esteves, 2010).

According to Myers and Myers studies (2004), 60% of dentists reported being in tension, depressed or suffering from insomnias; nearly 48% reported feeling tired for no apparent reason.

To Gerschman (1998) dentists, as any other health professional, learn very well how to treat other people but they do not know how to take good care of themselves. They have, besides lack of time, pride and fear of losing their status, a clear tendency to deny their own problems and a clear difficulty in accepting the need for psychological treatment (Gerschman, 1998).

The work-related stress in dentists may, not only compromise their health but also has a harmful effect in the quality of treatments they provide to patients (Perez-Padron, Bernabé *et al.*, 2010; Swanson & Power, 1999).

The etiology of stress among dentists

The most pointed stress factors among dentists are mainly time pressure, the need of keeping high levels of concentration, and having to deal with anxious and difficult patients (Ayers, Thomson *et al.*, 2008; Montasem, Brown *et al.*, 2013).

It is estimated that worldwide 5% to 22% of people suffer from anxiety or phobia to the dentist which is also a source of stress for the dentist himself (Hu, Gorenstein *et al.*, 2007; Palliser, Firth *et al.*, 2005).

According to Gerschman (1998), the dentist has to: a) work with the precision of a watchmaker, in a biological environment dipped in oral fluids and surrounded by muscles controlled by the patient; b) recognize, understand and deal with fears and anxiety of patients; c) manage the operation of the clinic, the working team, records, finance, laboratories and, d) stay himself/herself updated.

The rigorous academic training for dentistry runs dentists to perfectionism and to keep for himself the emotions, maintaining at the same time the external composure (Gerschman, 1998).

For some authors (Dimatteo, Shugars *et al.*, 1993), the main factors contributing to high levels of stress in dentists are: long and sometimes heavy working days, the presence of physical discomfort, such as back pain, the lack of contact and socializing with their working peers, financial problems, conflicts with the working team, relationship problems with difficult patients, the lack of free time and the perception that the profession is frowned upon by others in the society. Specially, DiMatteo *et al.* (1993) point out the demands of time and schedule, as the major stress factors in dentists.

Cooper, Watts *et al.* (1988), stated that the main stressors are related to time pressure, financial problems, problems with the working team, malfunctions in equipment and poor working conditions (Cooper, Watts *et al.*, 1988).

For other authors (Alexander, 2001), the biggest source of stress in dentists are themselves. Because they operate relatively isolated, without

interacting with working peers and - as they are perfectionists- with a compulsive attention to detail. They also get frustrated with the lack of motivation among their patients to achieve the goals of treatment, feeling a huge discrepancy between their ideals and the day-by-day reality. In addition, they have aggravating stress with the patient cancellation and increasing problems dealing with insurers (Alexander, 2001).

There are some evidences that the experienced degree of stress by dental professionals may vary depending on the area where they work, whether they are generalist or specialist, and among specialties (Newton, Allen *et al.*, 2006).

MUSCULOSKELETAL DISORDERS (MSDs)

Definition

The World Health Organization (WHO) defined musculoskeletal disorders (MSDs) as a disturbance in the muscles, tendons, nerves or vascular system which is not related to a brief or acute episode (Simões, Santiago *et al.*, 2008), and became worse due to work conditions (Lee, Wilbur *et al.*, 2008).

MSDs are characterized by the presence of discomfort, disability or persist pain in joints, muscles, tendons and other soft tissues caused or made

worse by repeated movements and forced or extended body postures (Harutunian, Gargallo-Albiol *et al.*, 2011).

They are progressive. Sometimes invisible, often highly stigmatized they are associated with periods of severe chronic pain, reduced mobility, or dramatic lifestyle changes (Baker, Gallois *et al.*, 2011).

History

Although MSDs have been mentioned on 1700 by Ramazzini (Sousa, 2012; Uva, Carnide *et al.*, 2008), been related to telegraphist in 1870, to washerwoman in 1895 and telephone operator in 1919, they became an important issue on the last decades of the twentieth century worldwide (Sousa, 2012).

The very first article about ergonomy and dentistry has been published in 1963 (Luís, 2009), but it was in 1982 that Kimmel defined ergonomic adapted to dentistry concerning on dentists, dental workers, patients and dental instruments (Luís, Assunção *et al.*, 2012).

Importance

MSDs are the most work related health problem in many industrialized countries and in Asian developing countries (Lee, Wilbur *et al.*, 2008). They are affecting 20 to 40% of adult population in developed countries (Rolander &

Bellner, 2001) and hundreds of millions of people worldwide (Baker, Gallois *et al.*, 2011).

Musculoskeletal (MS) problems are highly prevalent among working population, impacting quality of life, reducing work ability and causing early retirements (Melamed, 2009). MSDs are a public health problem (Sousa, 2012) and one of the most common causes of severe disability (Baker, Gallois *et al.*, 2011; Hagen, Linde *et al.*, 2011).

Human body is not prepared to maintain the very same body position for too long periods of time (Yamalik, 2007). Neutral posture allows relaxing well balancing muscles, but if not neutrals, postures can cause musculoskeletal symptoms (Yamalik, 2007).

Bad habits have cumulative effects with body adaptation to the abnormal and unbalanced posture, not only at work, but also on leisure activities (Kierklo, Kobus *et al.*, 2011).

Prevalence in Europe

The prevalence of musculoskeletal complaints (MSCs) increased in recent years (Hagen, Linde *et al.*, 2011), becoming a serious problem in Europe and in some Western countries (Droeze & Jonsson, 2005). Nowadays, MSD are the most common health problem in Europe, reaching millions of people: 25% of Europeans workers suffer from back pain and 23% from muscle pain (Sousa, 2012).

MS pain is a serious health problem in the industrialized world; it often starts at an early age (Røysamb, Tambs *et al.*, 2003).

Prevalence in Portugal

In Portugal, 39% of the population presents health problems related to cervical, upper and lower back spine (Sousa, 2012).

Portugal is the third country from European Union with the major index of occupational disability due to MSCs (Rodrigues & Pedro, 2013).

The MSDs were recognized as professional diseases in Portugal in 2001-2002. They stand in the first place in the occupational diseases reported in the districts of Lisboa, Porto and Setúbal. It is estimated that nearly 60% of MSDs stay undiagnosed in Portugal (Serranheira, Lopes *et al.*, 2005).

Oral health care constitute a vulnerable population to this injuries (Yamalik, 2007), being often affected by them (Serranheira, Cotrim *et al.*, 2012). MSDs are one of the most important occupational health matters in healthcare workers (Hagen, Linde *et al.*, 2011; Hayes, Cockrell *et al.*, 2009; Sousa, 2012).

Symptoms and Complaints of MSDs

Complaints related to the musculoskeletal system have greatly increased over recent decades and are extraordinarily frequent around the world (Tezel, 2005).

Musculoskeletal symptoms (MSS) may include discomfort and sensory changes, aches and pains, fatigue and weakness (Griffiths, Mackey *et al.*, 2011). A widely accepted definition of MSCs is body pain for at last 3 months during past year (Hagen, Linde *et al.*, 2011).

In the industrialized world, MSP is considered the major health problem affecting workers, (Langballe, Innstrand *et al.*, 2009), often experienced by young adults (Paananen, Taimela *et al.*, 2011). Pain comprises sensory, cognitive, affective, behavioral and social components (Bailey, Carleton *et al.*, 2010). It is a subjective and complex feeling that can be influenced by cultural, social and cognitive factors (Dogan, Saime Ay *et al.*, 2012), and can negatively impact the psychological condition of patients and their quality of life (Dogan, Saime Ay *et al.*, 2012).

The impact of chronic pain, if there are no specific organic cause, may be partly explained by psychosocial factors (Paananen, Taimela *et al.*, 2011).

MS pain related to work are multifactorial: they could appear as a result of multiple factors as prolonged, bad and static postures, repetitive movements, suboptimal lighting, genetics, age, obesity and mental stress (Kierklo, Kobus *et al.*, 2011; Tanikonda & Koneru, 2014).

Chronic pain

Chronic pain is common and a major public health problem (Corson, Doak *et al.*, 2011). It has negative effects on quality of life and productivity with large medical coasts becoming an enormous and heavy load to individuals and the society (Stubbs, Krebs *et al.*, 2010).

Chronic pain and depression may be mutually interactive (Bailey, Carleton *et al.*, 2010). There are some studies showing not only the co-occurrence of MS pain, exhaustion and disengagement but also the fact that

the interaction between burnout and MS pain intensify the illness experience (Langballe, Innstrand *et al.*, 2009).

Strong emotions and psychological distress have a crucial role on promoting symptoms of some idiopathic disorders such as fibromyalgia, irritable bowel syndrome and temporomandibular joint disease (Mcewen, 2007)

Beyond the fact that chronic MSP is health debilitating, it could affect tens of millions of people, cost billions of dollars in annual health care and cause lost of productivity (Bailey, Carleton *et al.*, 2010). People with chronic musculoskeletal pain are related to lower satisfaction with life as a whole (Boonstra, Reneman *et al.*, 2013).

Chronic pain and perceived stress may accelerate cellular aging (Sibille, Langaee *et al.*, 2012).

Back pain

It is defined as “lower back symptoms that occurred at least one week in the past year and caused at least moderate pain” (Lee, Wilbur *et al.*, 2008). It is increasing and can cause even disability (Dean, Hudson *et al.*, 2011). The prevalence of lower back pain is high (Dean, Hudson *et al.*, 2011; Lee, Wilbur *et al.*, 2008), reaching different professional groups (Lee, Wilbur *et al.*, 2008), Back pain represents over 50% of all MS problems (Melamed, 2009), affecting around 54 millions of American adults (Corson, Doak *et al.*, 2011).

Genetic factors have been found for back/ neck pain (Røysamb, Tambs *et al.*, 2003).

According to some authors neck and shoulder MS pain are the most common (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Tezel, Kavrut *et al.*, 2005) and the major cause of absence from to work all over the world (Rolander, Karsznia *et al.*, 2005).

Neck and shoulder pain has significant social and economic consequences as quitting the profession or reducing working hours (Morse, Bruneau *et al.*, 2010).

MSDs can be an occupational health problem for dentists (Hayes, Cockrell *et al.*, 2009).

MSDs among Dentists

Dentistry is a demanding profession (Ayers, Thomson *et al.*, 2009; Droeze & Jonsson, 2005; Hayes, Cockrell *et al.*, 2009; Tezel, Kavrut *et al.*, 2005), requiring an high level of mental demanding (Feng, Liang *et al.*, 2014). It requires concentration, precision and hand skills in a very inflexible working position (Tezel, Kavrut *et al.*, 2005).

Dentists tend to adopt an irrational working posture (Szymanska, 2002). Their usual forward bending, the repeated rotation to one side of the head, the neck and the trunk, the abduction of the arms away from the body, sitting in strained positions (Yamalik, 2007), put their lower back, neck and shoulder in risk (Cherniack, Dussetschleger *et al.*, 2010).

It has been reported that 84% of dentists had their neck bended while working (Morse, Bruneau *et al.*, 2010).

Human body is not prepared to maintain the very same body position for too long periods of time (Yamalik, 2007). If not neutrals, postures can cause MS symptoms (Yamalik, 2007). If neutral, posture allows relaxing well balancing muscles (Yamalik, 2007).

The prevalence of general MS pain is higher among dentists and well documented (Cherniack, Dussetschleger *et al.*, 2010; Hayes, Cockrell *et al.*, 2009; Yamalik, 2007), although some authors claimed that there are few studies focused on dentists (Alexopoulos, Stathi *et al.*, 2004).

Dentists have an higher risk of a variety of MS symptoms (Alexopoulos, Stathi *et al.*, 2004; Campos & Garcia, 2005; Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; GraçA, AraújJo *et al.*, 2006; Harutunian, Gargallo-Albiol *et al.*, 2011; Luís, 2009; Morse, Bruneau *et al.*, 2010; Rafeemanesh, Jafari *et al.*, 2013; Rolander, Karsznia *et al.*, 2005; Szymanska, 2002; Tezel, Kavrut *et al.*, 2005; Valachi & Valachi, 2003; Yamalik, 2007), reporting more cases than other healthcare professionals (GraçA, AraújJo *et al.*, 2006).

MSD are a the major health problem for dentists (Dogan, Saime Ay *et al.*, 2012; Droeze & Jonsson, 2005; GraçA, AraújJo *et al.*, 2006), and can be an occupational health problem for them (Hayes, Cockrell *et al.*, 2009).

Most prevalent MSDs for dentists

The symptoms dentists experienced mostly are back, neck and shoulder regions (Hayes, Cockrell *et al.*, 2009; Rafeemanesh, Jafari *et al.*,

2013), with 76% of dentists reporting pain from MS system including neck, shoulders and lower back (Rolander, Karsznia *et al.*, 2005).

Gupta et al. (Gupta, Ankola *et al.*, 2013), reviewed some international studies of MSD among dentists and have concluded that the high frequency of pain for neck and shoulder on dentists was consistent, causing them discomfort and interfering negatively with their daily activities. Back pain is one of the most common complaints on dentists (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Morse, Bruneau *et al.*, 2010).

As some studies do not related neck and shoulders pain separately it becomes difficult to compare the prevalence of these conditions (Hayes, Cockrell *et al.*, 2009) and makes results vary greatly between studies (Hayes, Cockrell *et al.*, 2009).

The prevalence of lower back pain increased greatly from 1980 to 1993 (Gupta, Ankola *et al.*, 2013) and, according to some studies (Gupta, Ankola *et al.*, 2013; Hayes, Cockrell *et al.*, 2009; Tanikonda & Koneru, 2014), it is the most prevalent MS problem among dentists.

Neck and shoulders pain are the most common complaint on dentist for some authors (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Morse, Bruneau *et al.*, 2010; Tezel, Kavrut *et al.*, 2005) and the second complaint (only to back pain) for some others (Morse, Bruneau *et al.*, 2010).

Neck pain is the natural consequence of neck flexion sustained for a long period of time by dentists which work hints an excessive forward bending of the head, 90% of the working time (Branson, Black *et al.*, 2010).

Hand and wrist was also the most prevalent symptoms related in some studies (Hayes, Cockrell *et al.*, 2009), with women being at more risk for hand/finger symptoms of MSD (Yamalik, 2007).

The prevalence of lower extremity MS pain is often less than 20%; overall, it is lower than for the upper extremity (Hayes, Cockrell *et al.*, 2009).

Etiology/ Risk Factors

There are various possible risk factors making it difficult to separate them and named a definite causal factor for MSD (Hayes, Cockrell *et al.*, 2009). Several authors agree on the multifactorial etiology of MSD (Droeze & Jonsson, 2005; Duarte & Serranheira, 2015; Harutunian, Gargallo-Albiol *et al.*, 2011; Melamed, 2009; Morse, Bruneau *et al.*, 2010; Sousa, 2012; Tanikonda & Koneru, 2014; Yamalik, 2007).

Multifactorial risk model for MSDs can be divided into professional risk, individual risk and psychosocial risk (Serranheira, Lopes *et al.*, 2005), depending on the duration, intensity and frequency of the risk factor (Uva, Carnide *et al.*, 2008).

Common risk factors for dentists are head rotation, neck flexion and upper arm abduction for mirror usage (Morse, Bruneau *et al.*, 2010).

Differently from sports, which can cause a direct injury, dental practice with the occurrence of repetitive use of dysfunctional postures and the cumulative micro traumas, may result in an unbalanced muscular function with pain (Yamalik, 2007).

Dentists use to work for long working hours maintaining static or awkward positions for long periods of time, which contribute to MSD (Feng, Liang *et al.*, 2014) and tend to injure their neck and lower back (Morse, Bruneau *et al.*, 2010) or their arms (Cherniack, Dussetschleger *et al.*, 2010).

Those inappropriate (Campos & Garcia, 2005; Morse, Bruneau *et al.*, 2010), prolonged (Cherniack, Dussetschleger *et al.*, 2010; Feng, Liang *et al.*, 2014; Morse, Bruneau *et al.*, 2010), and static (Droeze & Jonsson, 2005; Morse, Bruneau *et al.*, 2010; Rolander & Bellner, 2001; Yamalik, 2007) postures are the main causes for MSD which dentists complaint about.

Other causes, apart from the posture, such as working with their forearms unsupported (Hayes, Cockrell *et al.*, 2009), doing repetitive motions (Hayes, Cockrell *et al.*, 2009; Morse, Bruneau *et al.*, 2010; Rolander & Bellner, 2001; Yamalik, 2007) and using vibrating instruments (Hayes, Cockrell *et al.*, 2009; Yamalik, 2007), are also pointed on the etiology of MSDs and complaints which dentists suffer from.

Even if it is mild as it seems to be on dentistry, vibration has a cumulative effect on nerves and can lead to a vibration syndrome, especially on hands (Yamalik, 2007).

Beside biomechanical risk factors it must be considered the psychosocial factors – such as the work organization, daily working, job control, the support among coworkers (Morse, Bruneau *et al.*, 2010) and the presence of work-home conflicts, which are also related to stress and to MS pain (Morse, Bruneau *et al.*, 2010).

Psychosocial factors have been more and more recognized over the last two decades as a risk factors for MS problems, even as a predictor in some studies. They can be classified into three categories: firstly, the presence of job strain; secondly, personal characteristics like neuroticism, which can affect the way individuals appraise stressors and can cope with them; and thirdly, psychological distress symptoms and job dissatisfaction (Melamed, 2009).

The psychosocial characteristics of a high job demand, as dentistry, may interact with physiological factors, directly or indirectly, affecting the onset of MSDs (Feng, Liang *et al.*, 2014).

Although lower back pain related to work result from physical load or stress on body induced by a job task, it can be precipitated or worsened by psychosocial factors related to work organizational factors or to the perceptions or the belief that workers have on the organization of their work environment (Lee, Wilbur *et al.*, 2008).

Environmental factors must be considered (Yamalik, 2007), interacting with intrinsic individuals factors as personality type, and with coping strategies as social support (Palliser, Firth *et al.*, 2005). Social support has been considered important and related to health and well-being not only for the support on negative events, but also, on good times, by sharing positive events with others (Gable, Impett *et al.*, 2004).

Some attention has been given to computer use (Griffiths, Mackey *et al.*, 2011; Yamalik, 2007). The intensive use of computers and mobile phones seemed to have negative consequences on health, with perceived health complaints and MS symptoms (Hagen, Linde *et al.*, 2011).

The duration of computer work is a dominant risk factor for MS symptoms and disorders (Griffiths, Mackey *et al.*, 2011). Two hours of work, without a pause, have been strongly correlated to neck symptoms among computer users (Feng, Liang *et al.*, 2014). Less hours on table with computer tasks should be recommended (Yi, Hu *et al.*, 2013).

Consequences of MSDs

Although some symptoms do not lead directly to disabling situations, there are several studies pointing toward significant adverse impact of the MSD symptoms in daily life (Ayers, Thomson *et al.*, 2009; Cherniack, Dussetschleger *et al.*, 2010; Gupta, Ankola *et al.*, 2013; Hayes, Cockrell *et al.*, 2009; Morse, Bruneau *et al.*, 2010; Sousa, 2012; Uva, Carnide *et al.*, 2008; Wynne-Jones, Buck *et al.*, 2011; Yamalik, 2007), on health, the missed days and on income (Gupta, Ankola *et al.*, 2013).

The prevalence of MS complaints increased in recent years on several countries as England, Sweden and Spain (Hagen, Linde *et al.*, 2011), causing pain in the neck, shoulders, arms, wrists, hands, upper and lower back, hips, knees and feet (Hayes, Cockrell *et al.*, 2009). They impact work and productivity, causing sickness, absence and long term incapacity (Wynne-Jones, Buck *et al.*, 2011). Therefore, MSD has economic consequences for the individual, for the companies and the government (Sousa, 2012; Uva, Carnide *et al.*, 2008; Wynne-Jones, Buck *et al.*, 2011), estimated in large amounts on different countries as UK (Wynne-Jones, Buck *et al.*, 2011) and Portugal (Sousa, 2012; Uva, Carnide *et al.*, 2008).

In summary, MSDs may not only reduce the productivity (Hayes, Cockrell *et al.*, 2009; Morse, Bruneau *et al.*, 2010), but also cause disability (Cherniack, Dussetschleger *et al.*, 2010; Gupta, Ankola *et al.*, 2013; Sousa, 2012; Yamalik, 2007) and be the reason for early retirement (Ayers, Thomson *et al.*, 2009; Cherniack, Dussetschleger *et al.*, 2010; Gupta, Ankola *et al.*, 2013; Hayes, Cockrell *et al.*, 2009).

There is a similar level of MS symptoms reported by dentists across the world (Gupta, Ankola *et al.*, 2013; Hayes, Cockrell *et al.*, 2009). It has

been reported by Americans, Dutch, South Thai and Australian dentists (Yamalik, 2007); and also Scandinavian, Australian, Greece, Sweden (Cherniack, Dussetschleger *et al.*, 2010) and Spanish dentists (Harutunian, Gargallo-Albiol *et al.*, 2011). It has even been suggested that MSD might be more wide-spread among American dentists than the reported data suggests (Gupta, Ankola *et al.*, 2013).

Influence of Age and Gender

Symptoms of MSD appear very early in careers, with higher prevalence of MSD during dental education (Ayers, Thomson *et al.*, 2009; Faria, 2011; Gupta, Ankola *et al.*, 2013).

Nowadays, it is generally accepted that there are some marked differences between gender on reporting, tolerating and on the perception of pain (Khang & Kim, 2010). Men and women have different experiences and perceptions of pain. Women have lower tolerance to pain, reporting more symptoms and more severe pain, over more bodily areas, with greater frequency and longer duration, which some authors argued it could be explained by some psychological factors (Stubbs, Krebs *et al.*, 2010).

Although the presence of musculoskeletal injuries is higher regardless of the dentist gender, it seems that women report more complaints of MSDs than men (Ayers, Thomson *et al.*, 2009; Cherniack, Dussetschleger *et al.*, 2010; Harutunian, Gargallo-Albiol *et al.*, 2011; Khang & Kim, 2010; Pinheiro, Tróccoli *et al.*, 2002; Rafeemanesh, Jafari *et al.*, 2013; Rolander & Bellner, 2001; Stubbs, Krebs *et al.*, 2010; Tanikonda & Koneru, 2014; Yamalik, 2007).

Frequency (Harutunian, Gargallo-Albiol *et al.*, 2011) and severity (Hayes, Cockrell *et al.*, 2009) of MS pain is positively correlated with female gender.

Women report a higher incidence of severe pain in the cervical area, lower back, dorsal and wrist (Harutunian, Gargallo-Albiol *et al.*, 2011), stressing lower back pain (Rolander, Karsznia *et al.*, 2005).

As demands on dentistry are similar for male and female (Yamalik, 2007), the main reason for the reported differences between genders could be, as pointed by some authors, less physical strength (Harutunian, Gargallo-Albiol *et al.*, 2011; Rolander & Bellner, 2001), lower muscle tone and higher incidence of osteoporosis (Harutunian, Gargallo-Albiol *et al.*, 2011) women could have. Furthermore, some authors pointed the fact that women have more workload and more daily occupations than men (Rolander & Bellner, 2001; Serranheira, Lopes *et al.*, 2005).

Prevention of MSDs

Dental and medical professionals keep doing their jobs despite experiencing MS symptoms (Cherniack, Dussetschleger *et al.*, 2010). Dentists reported they had to endure pain to complete their work and are often or always in pain throughout their working days on dentistry (Feng, Liang *et al.*, 2014).

Several studies address recommendations for the prevention (Morse, Bruneau *et al.*, 2010). But, preventing MS symptoms must have a

multifactorial approach, as multifactorial is the etiology (Valachi & Valachi, 2003).

Prevention should take into account not only the cognitive aspects and ergonomic improvements (Alexopoulos, Stathi *et al.*, 2004), but also the combination between ergonomic interventions and health promotional activities (Morse, Bruneau *et al.*, 2010).

To prevent MSDs it is important to pay attention to symptoms, realize the occupational and individuals risk factors and implement recommended measures for health and safety (Yamalik, 2007).

Intervention for an ergonomic approach must be focused not only on the worker but also on the work organization, have the compliance of the subjects and be maintained over time (Droeze & Jonsson, 2005).

Prevention of MSD and promotion of dental ergonomics needs an interdisciplinary approach with the combining efforts of different subjects as dentistry, medicine, biomechanics physiotherapy and instruments industry (Gupta, Ankola *et al.*, 2013).

Knowledge about ergonomics, prevention, health and safety at work should be taught during undergraduate training and improved during graduate training (Szymanska, 2002).

Ergonomics

The goal of ergonomic is to find the best fit between workers and their working conditions, aiming to reduce cognitive and physical stress, making

sure that workers are safe, comfortable and less prone to working related injuries (Gupta, Ankola *et al.*, 2013).

The concept of dental ergonomics dates back to late 1950s, when was wrote the first paper on dental ergonomic. By 1960s, some procedural postures and rules began to be identified for sit-down dentistry (Gupta, Ankola *et al.*, 2013).

The lack of ergonomic principles can lead to musculoskeletal and psychosocial disorders with negative consequences for dentists health and, consequently, for the quality of the treatment done to the patient (Campos & Garcia, 2005). Good practices (Tanikonda & Koneru, 2014) can greatly reduce the expectancy of severity of MSD (Kierklo, Kobus *et al.*, 2011; Tanikonda & Koneru, 2014).

Main recommended preventive strategies, in a multifactorial approach (Valachi & Valachi, 2003), includes ergonomic awareness (for the equipment, indirect vision, correct positioning of the patient, avoid awkward or forced positions; use proper light and magnifiers), changing posture, taking breaks between patients with shaking and stretching exercises; take care of general health (leisure activities control of stress) and do physical exercises.

Firstly, the chair must be properly adjusted by the operator (Morse, Bruneau *et al.*, 2010; Valachi & Valachi, 2003) in the proper position (Morse, Bruneau *et al.*, 2010), avoiding the poor characteristic posture on dentistry with a static extended neck flexion position (Hayes, Cockrell *et al.*, 2009). It is important to keep the focus on postural awareness, because maintaining the low back curve (the lumbar lordosis), when sitting can reduce or prevent lower back pain (Valachi & Valachi, 2003).

Several authors advice to work with indirect vision (Morse, Bruneau *et al.*, 2010), with appropriate light position (Gupta, Ankola *et al.*, 2013; Yamalik, 2007) and intensity (Gupta, Ankola *et al.*, 2013). It is recommended the use of a surgical magnification system of loupes (Branson, Black *et al.*, 2010; Gupta, Ankola *et al.*, 2013; Valachi & Valachi, 2003; Yamalik, 2007) to improve the posture of dentists. The use of magnificent systems have been associated to the decreasing of neck and lower back pain (Valachi & Valachi, 2003).

Short pauses -rest break, at regular breaks (Morse, Bruneau *et al.*, 2010) can reduce the discomfort in musculoskeletal and nervous system (Kierklo, Kobus *et al.*, 2011).

Relax and stretching neck muscles are recommended (Gupta, Ankola *et al.*, 2013; Harutunian, Gargallo-Albiol *et al.*, 2011; Kumar, Rathan *et al.*, 2014): stretch for 15-30 seconds, two or three times a day would slowly decrease the tension in the muscles (Kumar, Rathan *et al.*, 2014).

Physical exercise have several benefits (Argyle, 2001; Gupta, Ankola *et al.*, 2013; Kumar, Rathan *et al.*, 2014; Neto, Junior *et al.*, 2013). They are the key element to be taken in account as rehabilitation exercises, for stretching and as regular aerobic activity (Harutunian, Gargallo-Albiol *et al.*, 2011). Physical exercise can decrease pain and increase quality of life in patients with chronic low back pain (Baena-Beato, Artero *et al.*, 2014).

Dentists must be aware of how exercise is important to people's health and select them individually, according to the needs and possibilities (Szymanska, 2002). They are recommended not only to prevent MSDs (Kumar, Rathan *et al.*, 2014; Yi, Hu *et al.*, 2013) but also for rehabilitation (Harutunian, Gargallo-Albiol *et al.*, 2011).

Aerobic exercises increase the blood flow to the tissues, improving the oxygen level on tissues and thereby their efficiency (Kumar, Rathan *et al.*, 2014).

The positive effects of aerobic exercise are also well known in aging. Furthermore, it also leads to neuroanatomical and neurophysiological changes - such as increased gray matter volume in the prefrontal and temporal areas and functional brain activity in superior parietal area and the anterior cingulate cortex (Holzel, Carmody *et al.*, 2010).

An untrained body is a risk factor for MSDs (Droeze & Jonsson, 2005).

Doing regular exercise may decrease the experience of MS pain (Memarpoura, Badakhshb *et al.*, 2013) and the development of MSD, providing dentists with a better health and decreasing risk of musculoskeletal symptoms (MSSs): dentists who practiced two times a week are less likely to have neck pain, when compared to those who did not (Feng, Liang *et al.*, 2014). The practice of regular exercise not only improves the strength and the cardiovascular conditioning as well as the body flexibility and balance but also has several phychological benefits (Lee, Yoon *et al.*, 2012).

Prevention with stress reduction is recommended by some authors (Gupta, Ankola *et al.*, 2013; Morse, Bruneau *et al.*, 2010).

The practice of Yoga is recommended by several authors (Gupta, Ankola *et al.*, 2013; Hartfiel, Burton *et al.*, 2012; Tanikonda & Koneru, 2014). It has been suggested that yoga, with their improvement on physical and psychological parts minimizes MS pain (Hartfiel, Burton *et al.*, 2012) (Tanikonda & Koneru, 2014), reduces back pain and perceived stress and is effective to improve general heath and well-being (Hartfiel, Burton *et al.*, 2012).

Body postures

A proper body posture is very important at work, as well, as during leisure activities (Kierklo, Kobus *et al.*, 2011). Bodily movements can affect emotional states (Carney, Cuddy *et al.*, 2010). While slumped posture is related to depression, upright posture makes people feel themselves more enthusiastic, stronger and confident and with higher self-esteem and pride (Nair, Sagar *et al.*, 2014).

Posture is related with emotions (Nair, Sagar *et al.*, 2014). It looks like the effects of embodiment extend to physiology and behavior going beyond emotion and cognition, suggesting that even a simple smile might also cause physiological changes (Carney, Cuddy *et al.*, 2010). By facial electromyography studies, the smile can be related both with negativity and positivity: nonenjoyment smiles are related to myocardial ischemic (Rosenberg, Ekman *et al.*, 2001), as well as sincere smile is with positivity (Fredrickson, 2010).

The manipulation of body postures, as well as facial expression, can affect the subjective experience of emotion (Sze, Gyurak *et al.*, 2010).

Postures reflect and produce power (Cuddy, Wilmuth *et al.*, 2012). High poses increase feelings of power and dominance, pain tolerance, and reduce stress, anxiety and cortisol - considered the stress hormone (Cuddy, Wilmuth *et al.*, 2012). Stress hormone may modulate brain function by changing the neurons structure (Mcewen, 2007).

As muscular states influence emotional attitudes (Nair, Sagar *et al.*, 2014), high power poses project more confidence and lead to higher overall performance evaluations (Cuddy, Wilmuth *et al.*, 2012).

Carney *et al.,* from Columbia and Harvard Universities, showed in their study that a simple two minutes power pauses is enough to change physiological, mental and emotional state in a significant way (Carney, Cuddy *et al.*, 2010).

Upright spinal posture may lead to more positive and less negative emotions, to more confidence, more arousal, better mood and higher self-esteem than a slumped posture (Nair, Sagar *et al.*, 2014).

In summary, slumped and upright postures influence not only the affective states but also the affective answers (Nair, Sagar *et al.*, 2014).

Stress, Musculoskeletal Disorders (MSDs) and Positive and Negative Emotions

Several studies emphasized the relationship between stress and MS pain (Alexopoulos, Stathi *et al.*, 2004; Fischer, Marshall *et al.*, 2012 ; Griffiths, Mackey *et al.*, 2011; Holmgren, Fjällström-Lundgren *et al.*, 2013; Kierklo, Kobus *et al.*, 2011; Melamed, 2009; Memarpoura, Badakhshb *et al.*, 2013; Rolander & Bellner, 2001) specially for neck, shoulders and back (Alexopoulos, Stathi *et al.*, 2004; Melamed, 2009). Psychological and emotional stress are important factors to initiate, aggravate (Tanikonda & Koneru, 2014) and affect the development and progression of the MSDs (Fischer, Marshall *et al.*, 2012). Mental stress causing musculoskeletal pain (Kierklo, Kobus *et al.*, 2011) could be by itself, if prolonged, a cause of MS disorders (Rolander & Bellner, 2001).

Even genetic factors have been reported to contribute to the relationship between back/neck pain and anxiety/depression (Røysamb, Tambs *et al.*, 2003), stress as a risk factor for MSDs is considered and supported by several studies (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Feng, Liang *et al.*, 2014; Fischer, Marshall *et al.*, 2012 ; GraçA, AraújJo *et al.*, 2006; Gupta, Ankola *et al.*, 2013; Kierklo, Kobus *et al.*, 2011; Langballe, Innstrand *et al.*, 2009; Melamed, 2009; Morse, Bruneau *et al.*, 2010; Palliser, Firth *et al.*, 2005; Rolander & Bellner, 2001; Sousa, 2012; Tanikonda & Koneru, 2014; Yamalik, 2007).

Negative emotions are positively correlated with MS complaints; they play an important role in the development of some diseases such as hypertension, diabetes and cardiovascular diseases (Vie, Glaso *et al.*, 2012).

Positive emotions are negatively correlated with the presence of MS complaints (Vie, Glaso *et al.*, 2012); acting as homeostatic, they keep the body psychologically well balanced (Vie, Glaso *et al.*, 2012).

POSITIVE APPROACH

Positive Psychology

Psychology was, in the past, more involved with negative aspects of human psychological functioning, than it was with the positive ones (Dambrun

& Ricard, 2011; Dambrun, Ricard *et al.*, 2012; Myers & Diener, 1995; Seligman & Csikszentmihalyi, 2000; Uysal, Satici *et al.*, 2014).

In the early 1990s, positive psychology, the study of positive attributes, psychological skills and strengths in people (Kobau, Seligman *et al.*, 2011), founded by Martin Seligman (Jayawickreme, Forgeard *et al.*, 2012; Martin, 2007; Schueller & Parks, 2014; Seligman, 2011a; Seligman, 2003), encouraged the study of optimal functions in individuals, groups and institutions (Dambrun & Ricard, 2011; Dambrun, Ricard *et al.*, 2012; Seligman, 2003). Positive psychology includes, according to Seligman and Csikzentmihalyi in 2000, three main fields: a) the subjective level, which is about well-being, contentment and satisfaction -in the past; hope and optimism – for the future; and, flow and happiness – in the present; b) the individual level, about positive individual traits, such as courage, perseverance, forgiveness, capacity for love, spirituality and wisdom; and c) the group level about civic virtues, such as altruism, tolerance and responsibility, and institutions that move individuals toward better citizenship, (Seligman & Csikszentmihalyi, 2000).

Recently, researchers become more interested on positive feelings (Uysal, Satici *et al.*, 2014), and scientists more focused in the study, understanding and improving of positive mental health (Wallace & Shapiro, 2006).

Positive psychology known over the past fifteen years (Layous, Chancellor *et al.*, 2011; Sin & Lyubomirsky, 2009) became a largely studied subject (Ryan & Deci, 2001), with the purpose of understanding the positive side of the way Man functions (Schueller & Parks, 2014), and not only to improve the quality of life, but also to prevent pathologies related to those

moments when life seems “barren and meaningless” (Seligman & Csikszentmihalyi, 2000).

With recent theories pointing psychological needs beyond physical ones (Diener, Ng *et al.*, 2010), the study of well-being and happiness has become an important issue on Positive Psychology (Dambrun & Ricard, 2011; Dambrun, Ricard *et al.*, 2012), and a key topic for recent researchers in this field (Ruch, Martínez-Martí *et al.*, 2014; Veenhoven, 2011b).

Acording to its founder Seligman (2003), the positive psychology was supported not only by the study of positive emotions, but also by the study of positive traits -such as virtues and intelligence, and the study of positive institutions - such as democracies and families (Ruch, Martínez-Martí *et al.*, 2014; Seligman, 2003). For Seligman (2011), the topic of positive psychology was happiness. Authentic happiness, according to Authentic Happiness Teory developed by Seligman, was based on three elements: positive emotions, engagement and meaning (Seligman, 2011a). Nowadays, Seligman stand up that positive psychology must have well-being as the topic, and flourishing as a goal (Seligman, 2011a). The well-being theory Seligman present now has two more elements besides positive emotions, engagement and meaning, which are the positive relationships and the accomplishment (Seligman, 2011a).

Positive Psychology has several physical health benefits (Gana, Bailly *et al.*, 2013; Millner, 2012), and promotes not only life enjoyment but also resilience (Millner, 2012), which is the ability to recover from negative emotional experiences, even in the presence of loss, hardship or adversity (Tugade & Fredrickson, 2004).

Subjective Well-being (SWB)

According to Veenhoven, the term “subjective well-being“ was firstly introduced in 1984 by Ed Diener (Veenhoven, 2012c). Subjective well-being (SWB) is also considered as the scientific term for happiness (Diener & Diener, 1996; Orkibi, Ronen *et al.*, 2014), and a way of measuring it (Lee, Lin *et al.*, 2013). Because the measures for happiness and well-being are often interchangeable, Lyubomirsky’s research group, defined well-being as “a global self-report of happiness, satisfaction and mood” (Sheldon, Boehm *et al.*, 2012).

Diener and Seligman (2004) agree on defining well-being as “people evaluation of their lives, including positive emotion, engagement, satisfaction and meaning” (Diener & Seligman, 2004).

Subjective well-being (SWB), a major need and life outcome (Lyubomirsky, 2011; Morinville, Miranda *et al.*, 2013), is considered a controversial and complex issue by some authors (Ryan & Deci, 2001).

Well-being (WB) is not just the absence of mental illness (Ryan & Deci, 2001); neither the absence of ill-being means the presence of high well-being (Ryff, Love *et al.*, 2006). The benefits from WB are not only the benefits of the absence of distress (Layous, Chancellor *et al.*, 2014).

Psychological well-being is not just the absence of mental disorder but also the presence of resources psychologically positive (Sin & Lyubomirsky, 2009). It includes components of hedonic or subjective well-being - like positive affects, life satisfaction and happiness (Lee, Lin *et al.*, 2013; Sin & Lyubomirsky, 2009), and components of eudaimonic well-being – self-acceptance, positive relations autonomy and purpose in life (Sin & Lyubomirsky, 2009). The hedonic approach is focused on happiness, and

define WB in terms of pain avoidance and pleasure attainment (Ryan & Deci, 2001).

As well as subjective well-being (SWB) is the evaluation of life in what concern the satisfaction and the balance between positive and negative affect, the psychological well-being (PWB) demand for the perception of engagemnent with the challanges life has (Keyes, Shmotkin *et al.*, 2002).

SWB has three related construct; positive affects and negative affects - the emotional component, and general satisfaction with life – the cognitive component (Lyubomirsky, 2011; Orkibi, Ronen *et al.*, 2014).

Recently, the self-determination theory, argues that individuals have three basic needs for WB: a) connectedness -feel close and connected to others; b) competence –fill that is skilled, and c) autonomy – the sense of control over their own choices (Nelson, Kushlev *et al.*, 2014).

For some authors, as Ryff and Keye (Keyes, Shmotkin *et al.*, 2002), positive well-being is distinct of subjective well-being (SWB). Positive well-being has a multidisciplinary approach on 6 distinct aspects: autonomy, personal growth, self-acceptance, purpose on life, mastery and positive relatedness, that promotes emotional and physical health (Ryan & Deci, 2001; Steger, Kashdan *et al.*, 2008).

Psychological Well-Being theory argued that eudaimonic well-being comprehend 6 constructs: relatedness, autonomy, personal growth, self-acceptance, purpose on life and environmental mastery (Steger, Kashdan *et al.*, 2008).

Optimal well-being is not attained by only choosing enjoyable and stress-free behaviors; it also requires a balance of psychological need fulfillment (Howell, Chenot *et al.*, 2011).

SWB is relatively stable across the life span (Ryan & Deci, 2001), but in an individual experience there are multiple aspects that can affect it (Howell, Chenot *et al.*, 2011). Genetic factors (to a certain level) strongly influence individual well-being (Lyubomirsky & Layous, 2013; Ryan & Deci, 2001).

Optimism is important for well-being (Diener, Wirtz *et al.*, 2010; Swami, Stieger *et al.*, 2009), whereas anxiety and depression correlates negatively with it (Grinde, 2012). SWB is related with better coping abilities, resilience, longevity, and improved mental and physical health (Orkibi, Ronen *et al.*, 2014).

SWB can vary depending on individuals life choices, but it seems that the variance in SWB is mostly explained by a person's temperament than by life circumstances (Howell, Chenot *et al.*, 2011).

Lately, WB has been described as a way of flourishing, and it has been argued to four different types of mental health in order to cultivate mental WB-conative, attentional , cognitive and affective (Wallace & Shapiro, 2006).

Hedonic and Eudaimonic Approaches of Happiness

Recent studies (Jayawickreme, Forgeard *et al.*, 2012; Peterson, Park *et al.*, 2005) on happiness have been emphasized two different approaches for happiness: hedonism and eudaimonism, founded on distinct views of human nature (Ryan & Deci, 2001).

Considering well being as multidimensional, it may include aspects from both hedonism and eudaimonism and their distinct or overlapped point of view (Ryan & Deci, 2001).

As long as hedonic approach of happiness is about emotions and subjective evaluation, the eudaimonic approach is about character, achievements and objective life circumstances (Schueller & Parks, 2014).

Hedonism argues that WB consists on pleasure and happiness; and eudaimonism believes that WB is the fulfillment or realization of a true nature (Peterson, Park *et al.*, 2005; Ryan & Deci, 2001).

Altough hedonism and eudaimonism have been established on different perceptions of man (Ryan & Deci, 2001), they are not mutually exclusive (Capaldi, Dopko *et al.*, 2014). These two perspectives of happiness are positively correlated and can reciprocally influence (Capaldi, Dopko *et al.*, 2014; Fredrickson, Grewen *et al.*, 2013). They both share some common sources and can reciprocally influence each other: to find meaning in life increase positive affects (PA); and, to feel PA invite people to find a positive meaning in life (Fredrickson, Grewen *et al.*, 2013). After all, this recent concept is much about the Aristotelic idea that to live a meaningful life is essential for happiness (Helliwell, Huang *et al.*, 2015; Peterson, Park *et al.*, 2005).

Hedonism

Hedonism interchangeably uses the concept of well-being and happiness (Robinson, Kennedy *et al.*, 2012), meaning that well-being is about

happiness, subjective experience of pleasure and avoidance of something unpleasant (Robinson, Kennedy *et al.*, 2012). According to hedonism happiness is about maximizing pleasure and minimizing pain (Peterson, Park *et al.*, 2005; Ruch, Harzer *et al.*, 2010).

Aristotle considered hedonic happiness a common idea that turns man into a slave of desires; he argued that true happiness is found in expressing virtues (Ryan & Deci, 2001). Often contested, this idea that virtue promotes happiness in ourselves and in others is a topic related to philosophy, religion and moral education (Martin, 2007).

Hedonic happiness, usually measured with self-report instruments, has 3 components: a) satisfaction with life; b) presence of positive mood and c) absence of negative mood (Robinson, Kennedy *et al.*, 2012).

Eudaimonia

Eudaimonia refers WB as being distinct from happiness (Ryan & Deci, 2001). Eudaimonia is referred as the fulfillment of the individual potential as a human being, realizing the potential of the human nature (Robinson, Kennedy *et al.*, 2012).

The eudaimonic theories pointed out the importance of effort and engagement of individuals on themselves, and the idea that people need a meaning in life (Steger, Kashdan *et al.*, 2008). In accordance with the eudaimonic concept of WB, people live according to their true self (Ryan & Deci, 2001).

This effort in engaging in meaningful pursuits is essential to eudaimonia well being (Peterson, Park *et al.*, 2005; Ruch, Harzer *et al.*, 2010; Steger, Kashdan *et al.*, 2008), and leads to more resilient fulfilled people (Steger, Kashdan *et al.*, 2008).

The more people engage in eudaimonic behaviors, the more well-being they report, the more they are supplied with positive affect and the more they acquire resources for their future (Steger, Kashdan *et al.*, 2008).

High level of life engagement (eudaimonic well-being) is related to lower levels of cortisol, lower levels of cardiovascular risk and lower levels of musculoskeletal symptoms (Ryff, Love *et al.*, 2006).

Besides, positive relationships with others and having a purpose in life are related to lower levels of inflammatory markers (Ryff, Love *et al.*, 2006).

Hedonic adaptation

Hedonic adaptation is the psychological process through which people have become used to positive or negative emotional stimuli (Dyrdal, Roysamb *et al.*, 2011; Lyubomirsky, 2011).

Hedonic adaptation leads people to have a tendency to adapt themselves to the emotional impact of positive and negative stimuli over time (Lyubomirsky, 2011, 2013; Parks, Porta *et al.*, 2012), with an eventual return to their original baseline level of happiness (Dyrdal, Roysamb *et al.*, 2011; Lyubomirsky, 2011, 2013; Parks, Porta *et al.*, 2012).

Even being faster for positive experiences, it occurs both for negative or positive ones (Lyubomirsky, 2011), because it seems that people are more

likely to have weaker emotional reactions and to hedonically adapt to positive events (Lyubomirsky, 2011).

Hedonic adaptation is adaptive. Otherwise, people would be overwhelmed by their emotions (Lyubomirsky, 2011). Despite being a challenge to the idea that happiness (well-being) could be improved (Diener & Oishi, 2005; Lyubomirsky, 2013; Robinson, Kennedy *et al.*, 2012), it helps people to recover from negative experiences (Sheldon, Boehm *et al.*, 2012).

Hedonic treadmill is the term used to explain why people tend to maintain a static state over well-being (Diener & Oishi, 2005; Lucas, Clark *et al.*, 2003), although accumulate experiences or objects which make them happy (Robinson, Kennedy *et al.*, 2012). Even there are some individual differences, the hedonic treadmill theory has had a great impact on SWB research (Lucas, Clark *et al.*, 2003; Seligman, 2003). It is an obstacle to the raising of the happiness levels, because people soon and certainly would adapt to the good things, taking them for granted (Seligman, 2003).

Hedonic adaptation is, nowadays, a “hot topic” among psychologists and economists (Lyubomirsky, 2011).

Positive Emotions (PE)

Positive emotions (PE) are the hallmark of well-being (Bastian, Kuppens *et al.*, 2014; Layous, Chancellor *et al.*, 2014) and happiness (Lyubomirsky, 2011). They are important to achieve goals, to nurture social bonds and to promote cognitive flexibility (Gruber, 2011). PE strongly influence cognitive functions (Røysamb, Tambs *et al.*, 2003).

There has been multiple and growing research demonstrating the direct health benefits of positive emotions and affects (Boehm, Lyubomirsky *et al.*, 2011; Catalino, Algoe *et al.*, 2014; Diener, 2006; Gana, Bailly *et al.*, 2013; Hirsch, Duberstein *et al.*, 2009; Kang & Gruber, 2013; Kobau, Seligman *et al.*, 2011; Kuppens, Realo *et al.*, 2008; Lyubomirsky, Sousa *et al.*, 2006; Mathews & Paulose, 2011; Ostir, Markides *et al.*, 2001; Salovey, Rothman *et al.*, 2000; Uchida, Norasakkunkit *et al.*, 2004), even in old age (Røysamb, Tambs *et al.*, 2003).

Positive emotions, like love or faith, may be the factors for sustaining health, having a direct and positive effect on the healing process and on the physiological processes that involve cardiovascular, inflammatory, immunological and neuroendocrine systems (Mathews & Paulose, 2011).

They promote positive social connections and high vagal tone, which is associated with a more prossocial behavior and friendship (Kok, Coffey *et al.*, 2013). By his side, vagal tone has a reciprocal influence in a self sustaining upward dynamic spiral with positive emotions, health and social connections: low vagal tone is linked to high inflammation and greater risk of myocardial infarctio (Kok, Coffey *et al.*, 2013).

As well as positive affect has been the important power to mitigate the effect of the negative events (Oishi, Diener *et al.*, 2007), the positive emotions can be antidotes to negative emotions (Layous, Chancellor *et al.*, 2014), by reducing stress reactions, leading the body to a balanced state, and thus undo the adverse effects of negative experiences (Kobau, Seligman *et al.*, 2011).

PE may also attenuate the harmful psychological and physiological effects of chronic medical conditions (Hirsch, Duberstein *et al.*, 2009).

They promote well-being and are associated to better psychological health and adaptive outcomes in various fields (Kang & Gruber, 2013), giving people psychological resources not only to deal with health problems but also to be more effective to prevent them (Salovey, Rothman *et al.*, 2000).

PE leads to several advantages in different fields of life, such as, superior job performances, better physical health (Gruber, Mauss *et al.*, 2011), higher creativity, enhanced marital satisfaction and social relationships (Layous, Chancellor *et al.*, 2011). They broaden the thought and attention, building on a long term basis intellectual, social, physical and psychological skills (Cohn & Fredrickson, 2010; Layous, Chancellor *et al.*, 2011), with benefits surpassing the moment they are experienced (Cohn & Fredrickson, 2010; Robinson, Kennedy *et al.*, 2012).

Broaden-and-build theory claims that even though the PE are short lived, the changes produced in people's thoughts, actions and physical responses have long lasting consequences (Cohn & Fredrickson, 2010; Fredrickson & Branigan, 2005).

Some studies have shown that the interventions on positive emotions could help changing the way one lives, or acquire new skills with long term behavior maintenance (Cohn & Fredrickson, 2010).

Self-generate positive emotions leads individuals to report fewer headaches, less chest pain, congestion and weakness when compared to a control group (Kok, Coffey *et al.*, 2013).

Positive emotions have contagious and accumulative effects over time (Fredrickson, 2004) with numerous outcomes as a better psychological and a physical health (Gruber, Kogan *et al.*, 2013) and an increasing life satisfaction (Cohn, Brown *et al.*, 2009).

As Fredrickson and Kok (Fredrickson, 2010; 2013) points in her broaden-and-build theory of positive emotions, they have long-term psychological effects by building a person's physical, psychological, intellectual and social resources in a upward spiral; the result is a stock of long-term resources that will increase resilience, making life richer and more meaningful (Fredrickson, 2010).

Positive emotions lead to future higher levels of resilience (Cohn, Brown *et al.*, 2009; Fredrickson, 2010; Lyubomirsky, Sousa *et al.*, 2006), defined by being a personality trait that reflects the individual's ability in adapting himself/herself to changing environments (Cohn, Brown *et al.*, 2009). Resilience, largely studied nowadays by neuroscientists, can be assessed by psychological measures or by direct measures of brain functions (Davidson & Schuyler, 2015).

Positive emotions build durable physical, cognitive and social resources which can successfully promote work, relationships and physical and mental health (Fredrickson, 2010; Lyubomirsky, Sousa *et al.*, 2006). They are also associated with advantages on the economic status, family and work (Kobau, Seligman *et al.*, 2011).

Experiencing positive emotions is a remarkable way for achieving greater happiness and life satisfaction (Kuppens, Realo *et al.*, 2008); to improve flourishing, resilience and psychological well-being (Layous, Chancellor *et al.*, 2011), and to build long-term intellectual, physical, psychological and social resources, as well as, curiosity and resilience (Fredrickson, 2010; Jayawickreme, Forgeard *et al.*, 2012).

Although studies are not in agreement about the way positive emotions vary along life (Kern, Eichstaedt *et al.*, 2014), it seems that negative emotions

consistently decline through adult life (Kern, Eichstaedt *et al.*, 2014), and older people presenting less variability for daily negative affects (Scott, Sliwinski *et al.*, 2014).

As long as positive emotions remained fairly stable, the overall positivity ratio increased with age (Kern, Eichstaedt *et al.*, 2014). However, the frequence positivity is felt is more important than the intensity is (Fredrickson, 2010).

This ratio of positive / negative emotions on overall well-being was firstly presented to the scientific community by Fredrickons and Losada (Fredrickson & Losada, 2005; Oishi, Diener *et al.*, 2007; Seligman, 2011a). Lately, in 2013, this ratio has been mathematicaly questioned (Brown, Sokal *et al.*, 2013). However, Barbara Fredricksons, even considering as invalid Losada´s model, reinforce the ideia that positivity ratios are significantly higher for flourishing individuals (Fredrickson & Losada, 2005).

Attitude, Moods, Affects

Atittude

Positive attitude is a determining factor of happiness and a characteristic of happy people (Mohanty, 2014). Positive attitude has a direct and significant effect on income and on employment (Mohanty, 2014).

Current studies have found that, more than any other factor, it is the individual positive attitude that determines an individual own happiness (Mohanty, 2014). Looking for the best side in every situation, a person with positive attitudes will realize and plan all the circumstances of life in a positive way, facing it in a more balanced way (Mohanty, 2014).

Mood

Mood, as weighing how often we feel good or bad (Rojas & Veenhoven, 2013), is characterized by a special mix of affective experiences (Veenhoven, 2013b).

Opposite to feelings and emotions, mood is unrelated from specific objects (Rojas & Veenhoven, 2013).

Positive mood is an important predictor of health and longevity (Mathews & Paulose, 2011), making people feel optimistic about the future and in control of their lives. Therefore, they are more likely to engage in social relationships and deal with stressful situations (Ostir, Markides *et al.*, 2001).

In contrast, negative mood hostility is one of the main sources of mortality and a risk factor for many diseases, such as coronary heart disease (Mathews & Paulose, 2011).

Optimism protects from physical diseases (Seligman, 2008).

Optimists remain more serene, thus gathering his/her energies for real threats; on average, optimists live 19% longer than pessimists (Ricard, 2003). There is also a strong association between high optimism and good quality of life (Seligman, 2008).

Affect

Affects represent feeling states and attitudes (Fredrickson & Losada, 2005).

Positive Affects (PA) and Negative Affect (NA) are distinctive affective states (Watson, Clark *et al.*, 1988). While positive valenced affect correspond to positivity, negative affect represent negativity (Fredrickson & Losada, 2005). As Positive Affect (PA) reflects how much a person feels enthusiastic, active and alert, Negative Affect (NA) is a dimension of subjective distress and unpleasant engagement that comprehends some aversive mood states like anger, contempt, disgust, fear and nervousness (Watson, Clark *et al.*, 1988).

Negative affects, which include unpleasant mood and emotions, are the result of negative events and circumstances that happen in people's life or health (Diener, 2006).

Positive affect - pleasant moods and emotions (Diener, 2006), is not the opposite of negative affects (Ryan & Deci, 2001). They are distinguishable constructs (Miron-Shatz, Diener *et al.*, 2013), and the presence of positive affects does not mean the absence of negative affects (Hirsch, Duberstein *et al.*, 2009).

Positive affects are related to a lower risk of physical illnesses (Mathews & Paulose, 2011) and to some healthy lifestyle habits – such as exercise, known for improving health and protecting people against chronic diseases (Ostir, Markides *et al.*, 2001). Exercise is one of the easiest and most effective methods to induce positive emotions (Argyle, 2001). Healthy individuals generally report very low levels of NA (Rocke, Li *et al.*, 2009).

Positive affects increase the immune function and decrease both the levels of cortisol and the inflammatory responses to stress, which leads to reduction on physical pain (Fredrickson & Losada, 2005).

Positive affects broaden focus and attention, which lead to increase cognitive flexibility, promoting openness to information and their integration (Ifcher & Zarghamee, 2014).

The areas related to the greatest positive affect are hobbies, faith and religion and the spiritual aspects of life (Miron-Shatz, Diener *et al.*, 2013). Spiritual experiences (be them religious or not) may nurture the human being (Damásio, 2003) and make life meaningful (Simões, Resende *et al.*, 2003). However, they are mental processes and, therefore, complex byiologigal processes (Damásio, 2003). Spirituality has being recognized as an important element for good health (Lee, Yoon *et al.*, 2012), strongly correlated to happiness and well-being (Simões, Resende *et al.*, 2003). Nowadays, spirituality is one of the principles for health promotion adopted by the World Health Organization (Lee, Yoon *et al.*, 2012).

To often experience positive affect is crucial to feel happy and, thus, have a high score on happiness (Moljord, Moksnes *et al.*, 2011). The effect of positive affect on behavior is associated to dopamine release (Ifcher & Zarghamee, 2014).

Therefore a state of high energy, full concentration and pleasurable engagement characterizes high Positive Affects, while sadness and lethargy are characteristic of low Positive Affects (Watson, Clark *et al.*, 1988).

According to some authors (Ostir, Markides *et al.*, 2001), high levels of positive affects are strongly associated with a reduced risk of stroke, both for men and women (Diener, Suh *et al.*, 1999).

Positive affects have a beneficial influence on longevity (Fredrickson & Losada, 2005), both in healthy and sick people (Gana, Bailly *et al.*, 2013; Uchida, Norasakkunkit *et al.*, 2004); they are associated with lower morbidity, and fewer symptoms of pain (Gana, Bailly *et al.*, 2013).

Positive affects are related to more satisfying social relationships and fewer psychopathology symptoms; they are directly linked to high job outcomes (Parks, Porta *et al.*, 2012) and productivity (Mathews & Paulose, 2011). Telling others about positive events in life is positively related to higher positive affect and life satisfaction; furthermore, the more people share it, the greater the benefits they have (Gable, Impett *et al.*, 2004).

Inducing positive affects has been considered a way to enhance immune functions and general health (Lyubomirsky, Sousa *et al.*, 2006).

On the contrary, negative affects are related to depression or depressive mood, increasing the level of anxiety and the feeling of hopelessness (Ostir, Markides *et al.*, 2001). Hopelessness, the generalized negative expectation about the future, is an essential part of depression and one of the most important long-term risk factor for suicide (Hjemdal, Friborg *et al.*, 2012).

The harmful of negative affects on physical health have been very well documented (Gana, Bailly *et al.*, 2013). Negative psychological states like depression, anxiety and distress are associated to the increased risk of coronary heart disease (Uchida, Norasakkunkit *et al.*, 2004). Depression itself directly increases the risk of stroke (Ostir, Markides *et al.*, 2001).

Positive affects and life satisfaction predict longevity among both younger and older adults (Gana, Bailly *et al.*, 2013) and are a predictor of reduced mortality (Uchida, Norasakkunkit *et al.*, 2004).

Positive affects are associated to lower mortality and morbidity (Nave-Leal, Pais-Ribeiro *et al.*, 2012), protecting health (Nave-Leal, Pais-Ribeiro *et al.*, 2012). They also broadens cognition (Fredrickson & Branigan, 2005; Fredrickson & Losada, 2005): people feeling PA are more efficient, creative, integrative, and open to information (Fredrickson & Branigan, 2005; Fredrickson & Losada, 2005).

Neuroendocrine and central nervous systems are both closely related to affective states (Uchida, Norasakkunkit *et al.*, 2004). When people are feeling positive affect the dopaminergic system in the brain areas related to executive control and flexible thinking is activated (Waugh & Fredrickson, 2006). The effects of positive affect are linked to increase dopamine levels in the brain, specially in the prefrontal cortex and anterior cingulate, related to better cognitive performances (Fredrickson & Branigan, 2005).

Positive and negative affects are associated with the releasing of immunoglobulin A (IgA): positive mood increases IgA, enhancing the immune system response in a positive way; negative mood decreases IgA levels (Salovey, Rothman *et al.*, 2000).

Expressing emotions can have some immediate effects on the immune system (Salovey, Rothman *et al.*, 2000) because each mood affects the natural killer cells activity (Salovey, Rothman *et al.*, 2000). Stress, as an example, negatively interferes both on the number and activity of these cells (Leite & Uva, 2010).

Broaden-and-build Theory

Fredrickson's broaden-and-build theory, the theoretical basis for the broaden and built effect of positive emotions, has already been supported by scientific experiments (Ashby, Isen *et al.*, 1999; Catalino & Fredrickson, 2011; Fredrickson, 2004, 2010; Fredrickson & Joiner, 2002; Wadlinger & Isaacowitz, 2006).

According to the "broaden-and-build theory of positive emotions", positive emotions such as joy, interest, contentment, and love, not only broads the individual's momentary thought-action repertoire, but also, builds the individual's personal resources (Cohn & Fredrickson, 2010; Fredrickson, 1998, 2010; Fredrickson, Coffey *et al.*, 2008; Gable, Impett *et al.*, 2004; Waugh & Fredrickson, 2006; Weytens, Luminet *et al.*, 2014), building reserves of durable physical, social, psychological and intellectual personal resources .

According to the "broaden-and-build theory of positive emotions", people who frequently experienced positive emotions are more satisfied not only because they are enjoying the positive emotions but also because they build resources to deal with life challenges for a long time (Cohn, Brown *et al.*, 2009; Fredrickson, 2010).

The Fredrickson's broaden-and-build theory of positive emotions point that deliberately increasing positive emotions leads to greater resources, like creativity, resilience, and openness to new experiences, which in turn, can encourage individual to engage in behaviors that will further promote well-being. Thus, a cycle will be created resulting in a positive feedback loop leading to an improvement in cognitive appraisal and positive emotions (Fredrickson, 2010; Schueller & Parks, 2014).

The Fredrickson's broaden-and-build theory suggests that people with positive emotions develop resources for their future (Fredrickson, 2010; Seligman, 2011a), learning new things and strengthening social relationships (Diener, Ng *et al.*, 2010; Fredrickson, 2010).

Positive emotions, which are adaptive in a long term (Fredrickson, 2010; Fredrickson & Branigan, 2005), serve not only to "broaden an individual's momentary thought-action repertoire" (Fredrickson, 1998), but might also create broad new thoughts and actions capable of changing people's life (Cohn, Brown *et al.*, 2009; Fredrickson, 2010).

Fredrickson's broaden-and-build theory states that as negative emotions narrow people's attention and cognition, positive emotions, on the contrary broaden attention (Fredrickson, 2010; Wadlinger & Isaacowitz, 2008), cognition (Catalino & Fredrickson, 2011; Fredrickson, 2010; Fredrickson & Branigan, 2005; Newall, Chipperfield *et al.*, 2013) and action (Fredrickson, 2010; Fredrickson & Branigan, 2005). Positivity is associated with biological health markers; furthermore it may induce dopamine and opiates production, as well as, optimizes immune functions and decreases inflammatory responses to stress. People who scores high positivity sleeps better and complains less about pain; they have lower risk for diabetes, high blood pressure, heart attack and for several other diseases (Fredrickson, 2010).

Positivity can change the brain and, consequently, the way people deal with life challenges (Ashby, Isen *et al.*, 1999; Fredrickson, 2010), be it with the effects on cognition (Ashby, Isen *et al.*, 1999; Fredrickson, 2010), in negotiations (Fredrickson, 2010), as students (Ashby, Isen *et al.*, 1999; Bryan & Bryan, 2001; Fredrickson, 2010), as liders (Fredrickson, 2010; Sy, Côté *et*

al., 2005), as doctors on medical decision for diagnosis, on aging (Fredrickson, 2010), or on building personal resources (Fredrickson, 2010; Fredrickson, Coffey *et al.*, 2008).

Furthermore, as positivity is contagious (Fredrickson, 2010; Sy, Côté *et al.*, 2005) it could also positively influence others.

The idea that negative emotional states, especially high anxiety and fear, narrow people's focus of attention has been proposed in 1959, by Easterbrook (Easterbrook, 1959; Fredrickson, 1998).

Neuroplasticity

Neuroplasticity is the brain's ability to change its structure and function, in response to experiences, thoughts and people's intentions (Davidson & Begley, 2013). Even if the precise mechanisms of plasticity are not yet still fully understood (Davidson & Mcewen, 2012), it is well known that brain functions tend to develop upon use (Grinde, 2005).

Although in adult age cellular and molecular level plasticity is limited (Holzel, Carmody *et al.*, 2010), the brain is intrinsically plastic (Holzel, Carmody *et al.*, 2010), with several different plasticity mechanisms, as neurogenesis and dendritic and synaptic turnover (Davidson & Mcewen, 2012).

The brain is constantly being shaped since the prenatal period to the end of life (Davidson & Mcewen, 2012) The early months and years of life are specially crucial for the development of the brain (Grinde, 2005). The plasticity

in the neural circuit underlying emotions can be used for therapeutic change, with or without the use of medicinal drugs (Davidson, Jackson *et al.*, 2000).

There is scientific evidence that some interventions, such as regular physical exercises, cognitive therapy and ancient contemplative practices, as meditation, induce plasticity related changes in the brain; these alterations support a range of positive outcomes (Davidson & Mcewen, 2012) and can be measured by magnetic resonance images (MRI) for both structural (MRI), and functional (fMRI) (Davidson & Mcewen, 2012; Davidson & Schuyler, 2015). The cognitive behavioral therapy induce physiological and functional changes in several brain areas (Knapp & Beck, 2008).

Nowadays people can (exactly as they do with physical exercises for body) take more responsibility in shaping their mind and brain by engaging in the practice of those mental exercises with the ability to induce plastic changes in the brain (Davidson & Mcewen, 2012).

Last findings pointed that even short two weeks train can induce measurable changes in the brain (Davidson & Schuyler, 2015).

Positive Psychology Interventions (PPI)

Happiness has been a goal pursuit by almost everyone. But, the ability to be happy largely varies across people (Luo, Huang *et al.*, 2014). The pursuit of happiness seems to be a delicate art. Even though it may be a tricky way, it is a worthwhile pursuit (Catalino, Algoe *et al.*, 2014).

The progress and the amount of researches on positive psychology have allowed researchers not only to understand why some people are happy but also suggest that people may learn how to increase their happiness levels (Layous, Chancellor *et al.*, 2011; Seligman, 2003). The integrative model of sustainable happiness (which comprehends the genetic set point, the circumstances and the intentional activities people do), suggests people to engage on pleasant activities in order to increase their happiness (Catalino, Algoe *et al.*, 2014). It looks like experiences make people happier than material belongings do (Lyubomirsky, 2011).

The study of psychological interventions in order to improve happiness has been growing over the last decade (Parks & Szanto, 2013). Our voluntary actions can rise our happiness in a significant way (Martin, 2007).

Individual well-being is strongly influenced by genetics. Nonetheless, researchers pointed out that most of the individual happiness is under their own individual control through intentional activities (Lyubomirsky & Layous, 2013).

People could intentionally and successfully raise their happiness levels by practicing gratitude and optimism, by performing acts of kindness, using one's strengths and by meditating on positive feelings (Layous, Chancellor *et al.*, 2014). The regular practice of optimism and gratitude has been proven to enhance life satisfaction (Boehm, Lyubomirsky *et al.*, 2011).

According to Lyubomirsky (Lyubomirsky, 2011), up to 40% of the individual happiness differences are determined by what people do, which leaves space for improvement, as well as, for resilience.

Positive psychology interventions (PPIs) are intentional activities with the purpose of cultivating positive feelings, behaviors or cognitions (Schueller

& Parks, 2014; Sin & Lyubomirsky, 2009); they significantly decreases psychological distress (e.g. anxiety and depression) and increases well-being (Dambrun & Dubuy, 2014; Hirsch, Duberstein *et al.*, 2009).

PPI are classified in 5 categories: savoring experiences and sensations; cultivating and expressing gratitude; engaging in acts of kindness; promoting positive relationships and pursuing hope and meaning (Schueller & Parks, 2014).

Positive emotions interventions predict short and long-term outcomes, such as, closer relationships, mental and physical health and longevity, both in healthy people and in those with chronic illnesses (Cohn & Fredrickson, 2010).

It has been strongly recommended that people learn how to activate or maximize the strategies on the positive psychology domain and block or minimize those in the negative domain (Lyubomirsky, 2011).

Over the past 15 years, some techniques of positive interventions have been validated as effective options to enhance happiness and health (Hirsch, Duberstein *et al.*, 2009; Weytens, Luminet *et al.*, 2014). They are being implemented in several fields as secondary education and the military on USA (Schueller & Parks, 2014).

Self-administered PPIs are effective and a sustainable way to became happier: their scientific study is still rather young, but the research on positive psychology highlighted strategies - as savoring, gratitude, kindness, social relationships, hope and meaning - to increase individual happiness (Parks & Szanto, 2013; Schueller & Parks, 2014). Purpose on life and positive relationships are also related with lower levels of inflammatory markers (Ryff, Love *et al.*, 2006).

Positive psychology interventions (PPIs) teach some ways how people can improve their own positive cognitions, emotions and behaviors, with no need for professional care (Layous, Chancellor *et al.*, 2011). They not only promote positive feelings, thoughts and behaviors, enhancing well-being (Layous, Chancellor *et al.*, 2011; Sin & Lyubomirsky, 2009), but also decrease depressive symptoms (Hirsch, Duberstein *et al.*, 2009; Parks & Szanto, 2013; Schueller & Parks, 2014; Sin & Lyubomirsky, 2009), as well as, suicidal thoughts and behaviors (Hirsch, Duberstein *et al.*, 2009).

Positive activity interventions (PAIs) have considerable theoretical and practical support in the literature (Layous, Chancellor *et al.*, 2011). Their effectiveness is enhanced with individual therapy and the assignment of multiple and different positive activities (Sin & Lyubomirsky, 2009).

To be protected from hedonic adaptation, to increase and sustain happiness, the process must be conscious and dynamic, varying both the activities and the circumstances, as well as, thoughts and behaviors (Lyubomirsky, 2011; Lyubomirsky & Layous, 2013). The sustainable happiness model (SHM) highlights that a positive new activity can maintain happiness over a period of time longer than genetics would predict by itself (Sheldon, Boehm *et al.*, 2012).

The sustainable happiness model (SHM) having in account the three main important factors (genetics, circumstances of life and intentional activities) to influence happiness, underscored activities as the one to be the most remarkable for sustaining increasing happiness (Sheldon, Boehm *et al.*, 2012).

Benefits of PPIs increase with age (Sin & Lyubomirsky, 2009), linearly due to wisdom and more effective emotion regulation associated to older ages

(Sin & Lyubomirsky, 2009). Self selected individuals, such as depressed people, benefit more from PPIs (Sin & Lyubomirsky, 2009).

Positive activity interventions (PAIs) are cost-effective, “convenient to deliver”, non stigmatizing, brief, self-administered, giving the patient the feeling that the improvement is due to himself and not caused by an external reason, with the consequent strengthening and autonomy of the patient (Layous, Chancellor *et al.*, 2011).

There are several validated positive exercises, such as, writing letters of gratitude, performing acts of kindness, meditating on positive feelings towards others or practicing optimism using “one’s signature strengths”, that have been referred in longitudinal studies as promoting positive feelings and thoughts with long last effects (Miron-Shatz, Diener *et al.*, 2013)

Some of the positive activities interventions (PAIs) already tested are: writing letters of gratitude; counting one’s blessings; practicing optimism; performing acts of kindness and using “one’s signature strength” (Layous, Chancellor *et al.*, 2014).

Expressing negative experiences (such as post traumatic experiences) has benefits for the well-being, improving life satisfaction and enhancing mental and physical health (Lyubomirsky, Sousa *et al.*, 2006).

Savoring, the ability of taking pleasure from life is partly inborn but can be cultivated to some extent (Veenhoven, 2011b), by everyone (Fredrickson, 2010). It is the active process of enjoyment (Miron-Shatz, Diener *et al.*, 2013). Savoring is about intensifying and extending momentary pleasurable experiences, by focus awareness and elaboration skills, respectively: reflect daily for at least 2-3 min on two pleasurable experiences, making the pleasure last as long as possible. Savoring, the pause to enjoy the positive aspects in

one's life (Lyubomirsky, 2011), is associated with beneficial outcomes (Gruber, Eidelman *et al.*, 2011). It increases happiness, life satisfaction, optimism and perceived control and decreases depression; savoring not only promotes well-being, but it is also a buffer against negative life events (Røysamb, Tambs *et al.*, 2003; Schueller & Parks, 2014). Meditation technique, providing training in attentiveness, could also be considered a training on savoring (Veenhoven, 2011b).

Gratitude, the feeling that one has benefited from the actions of another (Kruse, Chancellor *et al.*, 2014) is a temporary emotional positive state, which perfectly fits on Fredrickson's broaden-and-build theory, with long term benefits: broaden the way people think and connect with others, improving coping, friendship, and other social bonds (Fredrickson, 2004).

Gratitude, which includes grateful reflections and attitudes, like writing a gratitude letter or doing gratitude visit (Schueller & Parks, 2014), predicts multiple positive emotional and social outcomes (Kruse, Chancellor *et al.*, 2014). It increases emotional well-being, life satisfaction (Kruse, Chancellor *et al.*, 2014), positive emotions and physical health, decreasing depressive symptoms (Schueller & Parks, 2014). Gratitude has influence on relationships by promoting and maintaining them (Algoe, Haidt *et al.*, 2008). Happier people tend to perform kind acts, which increase their happiness in a positive feedback loop (Schueller & Parks, 2014).

The inter-action between individuals directly influences our happiness (Ruby, Smallwood *et al.*, 2013). The quantity and quality of interpersonal relationships are important in order to promote happiness (Schueller & Parks, 2014).

The regular practice of gratitude, optimism and savoring significantly increases well-being (Lyubomirsky, 2011).

Meaning in life- the general feeling that one's life is significant, predicts well-being, happiness and life satisfaction (Schueller & Parks, 2014).

Writing about the ideal future with all possible detail will also increase positive emotions (Schueller & Parks, 2014).

However, it should be noticed that those whom hardly try to maximize their happiness may feel worse, by experiencing a feeling of disappointment and self-blame (Catalino, Algoe *et al.*, 2014), which leads them to less happiness. Congruently with Self-centeredness/Selflessness Happiness Model (SSHM) theory (Dambrun & Ricard, 2011) selflessness, characterized by some affects like compassion and empathy promotes emotional stability, durable inner peace, serenity and is connected with authentic-durable happiness (Dambrun, Ricard *et al.*, 2012). Empathy (to share the feelings of others (Davidson & Schuyler, 2015; Gaspar, 2014)) and compassion (feeling concern for another, desiring conjointly to improve their well-being), which have been the anchor for many contemplative traditions, are related to positive emotions increasing (Davidson & Schuyler, 2015).

Authentic and durable happiness is characterized by meaning and engagement, intrinsic and pro-social values, gratitude, wisdom and selflessness. For the authors of SSHM (Dambrun, Ricard *et al.*, 2012), all this characteristics are simultaneously antecedents and consequences of authentic-durable happiness, which they define as a state of durable contentment and plenitude or inner-peace - an optimal way of being (Dambrun, Ricard *et al.*, 2012).

Self generated thoughts

Thoughts are the way people consciously perceive their concerns, dreams, hopes and life circumstances. They may be malleable and contribute to enhance satisfaction in life (Miron-Shatz, Diener *et al.*).

Recently cognitive sciences and psychology pointed out that the mind has the ability, using previously stored information, to self-generated thoughts (SGT), which counts 50% of the waking thought (Levinson, Smallwood *et al.*, 2012; Ruby, Smallwood *et al.*, 2013). Acording to Fredrickson (2010) there are several of scientific studies reporting that whenever people change their own thoughts, they also change emotions they feel (Fredrickson, 2010).

Emotional valences related to thoughts can be internal sources of joy as well as for distress (Miron-Shatz, Diener *et al.*, 2013). The cognitive behavioral therapy is one way to help people to transform their negative automatic thoughts into positive thinking (Disner, Beevers *et al.*, 2011; Knapp & Beck, 2008; Lee, Yoon *et al.*, 2012).

Life satisfaction may be improved by modifying both emotional valences and the frequency of thoughts about life (Miron-Shatz, Diener *et al.*, 2013). Damásio (2003) pointed that, counting on the fact that happiness leads to health and flourishin, individuals should rationally look for happiness. Feeling himself in concordance with Espinosa, António Damásio advises individuals to gradually create greater avalabilty for positive emotions which will promote some kind of “mental immunology“ (Damásio, 2003).

A success way to resolve problems depends on the capacity individuals have to select the most efficient strategy to move forward out of the problem (Ruby, Smallwood *et al.*, 2013).

Flourishing

The main objective of positive activity interventions (PAIs) is pushing people from the non-depressed state to flourishing (Layous, Chancellor *et al.*, 2011).

Ryff and Singer (Ryff & Singer, 1998) developed the theory of human flourishing (Ryan & Deci, 2001), which is a state of optimal mental health (Catalino & Fredrickson, 2011), in which the mind is simultaneously focused and relaxed (Ricard, 2003).

Flourishing is an ideal subjective psychological state, in which, people are so involved in an activity that nothing else seems to matter (Robinson, Kennedy *et al.*, 2012), feeling that they are realizing their potential (Jayawickreme, Forgeard *et al.*, 2012)

The research validates flow as an ideal experience associated to happiness, with multiple benefits, higher self-esteem, positive experience and the feeling that their lives are more purposeful and meaningful (Robinson, Kennedy *et al.*, 2012).

On flow, that experience of being intensely absorbed in an activity, an experiment or a feeling, establishes a resonance between action, external environment and mind. There is a sense of transcending ego and time, as the whole being is evolved, and every skill being used to the utmost (Ricard, 2003), and nothing else seems to matter (Csikszentmihalyi, 2002).

High levels of positive emotions are of supreme importance to flourishing (Gruber, Kogan *et al.*, 2013). People who flourish regularly feel positive emotions and are involved in a constructive way in the world around them (Catalino & Fredrickson, 2011). Both happiness (Damásio, 2003) and well being (Wallace & Shapiro, 2006) leads to flourishment.

Meditation

Mental training includes either classic cognitive therapies and meditation-based interventions (Perlman, Salomons *et al.*, 2010). Meditation is an emotional complex and an attention regulatory process (Kok, Waugh *et al.*, 2013), developed for various purposes among which are the cultivation of WB and the emotional balance (Lutz, Slagter *et al.*, 2008).

Although often considered by some people as an esoteric religious rite, meditation is a mental tool to strengthen the capacity mind has to keep attention (Winzelberg & Luskin, 1999). But, according to Matthieu Ricard, meditation is not a hobby or an exotic practice; it is practical and fundamental, having a deep effect on well-being; furthermore, it can be integrated in everyday life (Kabat-Zinn & Davidson, 2011).

Research on meditation started some decades ago, but the focus on its influence on the emotional process and regulation is still just beginning (Davidson, 2010).

Recently, the scientific community has shown a renewed interest in meditation, specially in the impact that brain training can have on psychological and physiological functions (Levenson, Ekman *et al.*, 2012).

Nowadays, it is pointed as a successful intervention well-being (Boehm, Lyubomirsky *et al.*, 2011), because the practice of meditation leads to a general decrease on the activity of the sympathetic nervous system with a feeling of relaxation (Winzelberg & Luskin, 1999).

Several studies have suggested the utility and importance of the practice of meditation by the influence it has on the emotional complex and on the reactions people have to stress and to the different challenges of life (Levenson, Ekman *et al.*, 2012).

Meditation improves positivity and all the benefits it has (Fredrickson, 2010).

By inducing psychological changes on emotion regulation and self-regulation (Davidson, 2010; Kok, Waugh *et al.*, 2013), meditation has an impact on the emotional process (Davidson, 2010).

The practice of meditation stimulates both cognitive and emotional process (Kok, Waugh *et al.*, 2013), resulting in an improvement in psychological health (Garland, Gaylord *et al.*, 2011; Gruber, Mauss *et al.*, 2011). The practice of meditation has also physiological and cognitive-behavioral effects by training people in order to reduce stress and to manage some chronic diseases (Winzelberg & Luskin, 1999). Several meditation practices interfere with the functioning of the cardiovascular and immune systems, in the pain perception (Kok, Waugh *et al.*, 2013; Snyderman, 2011), with predictors of longevity and with all the markers of physical health (Kok, Waugh *et al.*, 2013). Practicing meditation in regular sessions, even if they are brief, becomes familiar, has a second nature, a new way of being (Ricard, 2003).

There are several studies reporting changes in the attention process and in the brain structure related to meditation (Lutz, Slagter *et al.*, 2008; Ricard, 2013). These related brain regions change both structure – the volume, higher number of neurons and connections between them – and the function (Ricard, 2013).

Meditation seems to be a relevant exercise to the brain (Grinde, 2012; Snyderman, 2011). Long-term meditation leads to neuronal plastic effects in specific neuronal circuits (Ferrarelli, Smith *et al.*, 2013).

Because of the regulatory function on attention and emotion, the practice of meditation has a long-term impact both on the brain and behavior (Lutz, Slagter *et al.*, 2008).

Training meditation induces both functional and anatomical neuronal changes, producing measurable changes in brain activity (Ferrarelli, Smith *et al.*, 2013; Ricard, 2013), namely an increasing in alpha, theta frequency and gamma amplitude (Ferrarelli, Smith *et al.*, 2013). Meditation is associated with the fast-frequency oscillation gamma (Davidson, 2011; Singer, 2011), around forty hertz (Singer, 2011), specially in the prefrontal cortex which is related to emotion regulation (Davidson, 2011).

Gamma frequency activity is related to cognitive control and to the neuroplasticity process, such as, attention, learning and long-term memory (Ferrarelli, Smith *et al.*, 2013). The increase of gamma frequency is positively related to the amount of time of meditation practice: daily practice and meditation retreat contribute differently to the neuroplastic changes induced by meditation on brain (Ferrarelli, Smith *et al.*, 2013).

The brain activity shows different profiles according to the amount of hours of practice (Davidson, 2010; Davidson, 2011). Long-term meditators create more stable mental states than untrained meditators (Lutz, Slagter *et al.*, 2008). Higher frequency predicts higher psychological well-being (Ferrarelli, Smith *et al.*, 2013), but the results are also related to individual differences and to a complex interaction between genetic predisposition, environmental circumstances and individual training (Davidson, 2010).

Meditation by creating a buffer against “being overwhelmed by harmful emotional states (Levenson, Ekman *et al.*, 2012), can be an important help to

successfully regulate emotions (Levenson, Ekman *et al.*, 2012) and to protect against the effects of high stress (Jacobs, Shaver *et al.*, 2013).

Even if there are many ways of meditating, they all share the common function of inner transformation (Ricard, 2003). A long term consequence is the transformation of the trait affect (Davidson, 2010). From the nearly hundred different types of meditation, Mindfulness, Vipassana, Shamatha or Loving-kindness (LKM) can be mentioned as example, where the practitioners maintains focused on the moment (Kok, Waugh *et al.*, 2013). These practices are negatively related to cortisol levels, to ruminations and casually to negative affect which, in their turn, are associated to the increasing in the salivary cortisol levels (Jacobs, Shaver *et al.*, 2013).

Contemplative practices are believed to alleviate psychological problems, to reduce negative affects, rumination, anxiety and depression and to increase positive affect and mindfulness (Kemeny, Foltz *et al.*, 2011). They are practiced by millions of individuals from many different religions around the world and known by promoting mental skills, by treating mental disorders and by enhancing mental and physical health. One of these practices is mindfulness (Kemeny, Foltz *et al.*, 2011).

Meditation practices, especially mindfulness meditation (MM), became one contemporary cognitive behavioral treatment and a very popular topic in contemporary psychology (Hofmann, Grossman *et al.*, 2011), with the focus of the scientists on it (Davidson & Schuyler, 2015). Mindfulness is the mental full attention and acceptance of the present moment without judgment (Kabat-Zinn, 2011; Kemeny, Foltz *et al.*, 2011) or emotional reactivity (Kemeny, Foltz *et al.*, 2011). It leads to a state of mindful awareness: the broaden attention

with the increasing cognitive flexibility, makes reappraisal easier leading to an upward spiral of positive emotions (Garland, Gaylord *et al.*, 2011)

Mindfulness meditation increases pain tolerance and cardiovascular function (Hofmann, Grossman *et al.*, 2011). It also has effect on the cellular level reducing cytokine and interleukin secretion, and increasing natural killer cells activity (Kaliman, Álvarez-López *et al.*, 2014).

Furthermore, MM has several psychological benefits (Hofmann, Grossman *et al.*, 2011), such as to decrease rumination (Kemeny, Foltz *et al.*, 2011; Kok, Waugh *et al.*, 2013), to improve emotion regulation as well as the process of how to recover from stress (Jacobs, Shaver *et al.*, 2013; Kok, Waugh *et al.*, 2013). It can also play a very important role in preventing depression (Segal, 2011).

The therapeutic effect that mindfulness has on stress reduction is now well established; its capacity to influence both cardiovascular and autonomic systems overlap the idea that MM could be no more than a relaxing activity (Garland, Gaylord *et al.*, 2011).

Mindfulness can have beneficial changes in emotion regulation, during distress or physical suffering (Kemeny, Foltz *et al.*, 2011).

While anxiety exacerbate the experience of pain, meditators keep reporting pain as less unpleasant (Lutz, Mcfarlin *et al.*, 2013) or attenuated (Kaliman, Álvarez-López *et al.*, 2014).

Furthermore, with its ability to successfully regulate emotions, mindfulness may interfere with the working memory capacity (Jacobs, Shaver *et al.*, 2013).

Recent literature suggests that not only mindfulness-based therapy reduces negative psychological states such as stress, anxiety and

depression, but also the treatment effects maintained over follow-up (Hofmann, Grossman *et al.*, 2011).

The Mindfulness-Based Stress Reduction (MBSR) showed clinically significant reduction in pain and other medical symptoms (Perlman, Salomons *et al.*, 2010). As Jon Kabat Zinn points although mindfulness is not a therapy, neither a psychotherapy, it has therapeutic effects (André, Kabat-Zinn *et al.*, 2013).

Some studies point the effectiveness of interventions in teaching people and the impact that their thinking and appraisal styles could have on them (Oliver, Mansell *et al.*, 2010).

Loving-kindness meditation (LKM), as well as compassion meditation (CM), do not require concentration on a specific object or image but on the desire for the happiness of others (LKM), as well as the wish of relieving others sufferings (CM) (Lutz, Brefczynski-Lewis *et al.*, 2008). Both are related and include the practice of mindfulness (Hofmann, Grossman *et al.*, 2011).

Loving-kindness meditation (LKM) has been suggested to be an effective technique to improve the well-being and to provide a better psychological adjustment to pain (Weytens, Luminet *et al.*, 2014). Neuroendocrine studies suggest that CM may reduce stress (Hofmann, Grossman *et al.*, 2011). Training it seems to be a powerful method to enhance positive affects, strengthening personal resources and improve health, and it can be used as a buffer against stress, depression and anxiety (Klimecki, Leiberg *et al.*, 2013).

Compassion training induces functional neural plasticity in brain regions, such as ventromedial prefrontal cortex, putamen, pallidum and ventral tegmental area (Davidson & Schuyler, 2015; "World happiness report,"

2015). These areas are also associated to positive affects (Davidson & Mcewen, 2012; Klimecki, Leiberg *et al.*, 2013), and to decreasing anxiety and negative affects (Davidson & Mcewen, 2012).

Recent studies (Davidson & Schuyler, 2015; Heller, Johnstone *et al.*, 2013; Heller, Lapate *et al.*, 2014; Heller, Reekum *et al.*, 2013; Klimecki, Leiberg *et al.*, 2013; Luo, Huang *et al.*, 2014; Lutz, Brefczynski-Lewis *et al.*, 2008) have been developed using functional magnetic resonance imaging (fMRI) in order to assess brain activity.

Both LKM and CM may enhance the activation of the brain in those areas involved in empathy and emotional processing. Both may be trained within a relatively short period of time (Hofmann, Grossman *et al.*, 2011).

The neuro-science of compassion evidenced the functional neural plasticity induced by the compassion training (Davidson & Schuyler, 2015; Klimecki, Leiberg *et al.*, 2013).

Some researchers as Tania Singer, have started now studying neuro plasticity related to socio-affective skills (Klimecki, Leiberg *et al.*, 2013; Klimecki, Leiberg *et al.*, 2014; Przyrembel, Smallwood *et al.*, 2012) further than related to motor and cognitive abilities, as it had been studied for decades (Klimecki, Leiberg *et al.*, 2013).

Even vagal tone being a stable trait (as a measure of autonomic regulation, associated with cardiovascular health and the regulation of cognition, emotions and some physiological systems), it can be improved by the experience of sustained self-generated positive emotion which could happen with the practice of loving-kindness meditation (Kok, Coffey *et al.*, 2013).

In summary, meditation is a self-mental training to cultivate well-being and psychological health (Ferrarelli, Smith *et al.*, 2013), with benefits in what concerns the relieving of stress and pain (Kok, Coffey *et al.*, 2013).

HAPPINESS

Happiness is a major theme from antiquity (Myers & Diener, 1995; Veenhoven, 2004b) largely studied ever since Aristotle (Grinde, 2012; Lyubomirsky & Lepper, 1999), whom considered that happiness was the main purpose people, be man or woman, had in life (Csikszentmihalyi, 2002).

What happiness is about has long been debated all over the world with different concepts from different cultures (Lee, Lin *et al.*, 2013), but still remains as a philosophical speculation topic (Veenhoven, 2011a).

The interest in happiness has grown during the last decades individually, among citizens and policy–makers, with an increasing sales of books about “how to be happy” (Brulé & Veenhoven, 2014; Veenhoven, 2014b). “Policy-makers” are greatly aware of it in some countries such as Bhutan, aiming the “Gross National Happiness” (Brulé & Veenhoven, 2014), rather than Gross National Product ("World happiness report ", 2012); or the United Kingdom, writting in their political agenda “the call for greater happiness for a great number” (Brulé & Veenhoven, 2014), or the United Arab Emirates making happiness one of the goals of their national policy, by stating on their National Agenda that they want “to be the happiest of all nations” (Helliwell, Layard *et al.*, 2015).

The well-known Bhutan story of happiness started in 1972, when the King declared the goal of happiness over the one of wealth. The 1st World Happiness Report ("World happiness report ", 2012), presented Bhutan as a case study, as well as the Gross National Happiness Index (GNH).

The pursuit of happiness has been mentioned with honor and as a right and a goal in some particular important societies documents as the Declaration of Independence of the United States of America (Fisher & Shapiro, 2006; Lyubomirsky, Sheldon *et al.*, 2005; Mauss, Tamir *et al.*, 2011; Whitley & Henwood, 2014) and the Portuguese Constitution, mentioned in this case with the similar word of well-being (Pais-Ribeiro, 2012). Some cities, such as Santa Monica (California, USA) and Bristol (UK) as well as some states, such as Jalisco in Mexico or United Arab Emirates made happiness a key objective (Helliwell, Layard *et al.*, 2015).

All over the world, happiness has always been an important goal for the humankind (Catalino, Algoe *et al.*, 2014; Dyrdal, Roysamb *et al.*, 2011; Gruber, Mauss *et al.*, 2011; Layous, Nelson *et al.*, 2012; Lyubomirsky, 2011; Lyubomirsky, King *et al.*, 2005; Lyubomirsky & Lepper, 1999; Lyubomirsky, Sheldon *et al.*, 2005; Mauss, Tamir *et al.*, 2011; Moljord, Moksnes *et al.*, 2011; Parks, Porta *et al.*, 2012; Sin & Lyubomirsky, 2009; Uysal, Satici *et al.*, 2014; Veenhoven, 2012c).

Recently, the study of happiness grown in relevance (Veenhoven, 2004b, 2012a). Approached by several scientists (Grinde, 2012; Robinson, Kennedy *et al.*, 2012) it became not only a matter of greater importance (Dambrun, Ricard *et al.*, 2012; Veenhoven, 2012a), but also a major topic on social sciences, economic and positive psychology (Veenhoven, 2014b).

Happiness is more and more strongly desired all over the world (Boehm, Lyubomirsky *et al.*, 2011), regardless the culture (Dyrdal, Roysamb *et al.*, 2011). It is still one of the main purposes men have in life (Bastian, Kuppens *et al.*, 2014; Kuppens, Realo *et al.*, 2008), and what parents wish for their children (Layous, Nelson *et al.*, 2012; Lloyd, 2011).

The psychologists are nowadays closer to understanding what makes people happy (Kuppens, Realo *et al.*, 2008). The empirical researches on happiness started with social sciences around the 60's, and happiness became strong subjective indicator of the performance of the social system (Veenhoven, 2004a).

Survey research on happiness started in the second half of the 20th century (Veenhoven, 2015a) and took off in the early 1970s. (Veenhoven, 2011a).

The main sources for database on happiness worldwide are the World Database of Happiness (WDH) and the World Happiness Report (WHR).

The "Databook of Happiness" is a reference book, published in 1984 by Ruut Venhoven; this collection on happiness research was the basis for the World Database of Happiness (Veenhoven, 2012b, 2014e).

Database on average happiness is available in the World database of Happiness, with all the acceptable measures that fit the concept of happiness as life satisfaction, on "Measures of Happiness" (Veenhoven, 2015a). The World Database of Happiness distinguishes overall happiness, contentment and affect level measures (Veenhoven, 2012b).

In March 2012, the World Database of Happiness was an archive consisting of 20.000 finding. From these, 5.000 were about how satisfied

people are with their life in different nations; and 15.000 were correlational findings (Veenhoven, 2013b).

“Happiness in Nations”, in WDH, contains 5568 findings on the average happiness of the general population in 164 nations, since 1946 until 2012. (Veenhoven, 2015a).

The first World Happiness Report (WHR) was published in 2012 in order to support the April United Nations High Level Meeting on Happiness and Well-being. It included the ranking of national average life evaluation based on Gallup World poll data for 156 countries, from 2005 to 2011 ("World happiness report ", 2012).

Life evaluation, in the context of the World Happiness Reports has been assessed, in a scale of 0 to 10, with (in addition to the meaning in life and the presence of positive and negative affects) 6 variables keys, such as the Gross Domestic Product (GDP) per capita, social support, healthy life expectancy, freedom to make choices, generosity and freedom from corruption (Helliwell, Huang *et al.*, 2015; "World happiness report ", 2012; "World happiness report ", 2013; "World happiness report," 2015).

The WHR 2013, published under the supervision of the Sustainable Development Solutions Network, included the 2010-2012 levels and the changes from 2005-2007 to 2010-2012 ("World happiness report ", 2013).

The WHR 2015 includes, beside the 2012-2014 average for life evaluation across the world and the analysis of changes from 2005-2007 to 2012-2014, some chapters related to social values and to the neuroscience of happiness. Being in mind the fact that one-third of global population are now under 18 years-old, the WHR 2015 also emphasized the importance of the happiness in children and the mental health prevention (Helliwell, Layard *et*

al., 2015). The WHR includes the ranking of happiness for 158 countries/ territories and the ranking by changes in the happiness for 125 countries/ territories ("World happiness report," 2015).

Definition

Happiness is a difficult concept to specify (Veenhoven & Hagerty, 2006) with countless definitions (Ricard, 2003; Uysal, Satici *et al.*, 2014) and different and several meanings, both on popular and on academic language (Ribeiro, 2012).

Early psychological studies on happiness defined it as well-being (Jayawickreme, Forgeard *et al.*, 2012).

The word happiness has been broadly defined as subjective well-being (Lyubomirsky & Lepper, 1999; Pais-Ribeiro, 2012; Veenhoven, 2004a) associated (Swami, Stieger *et al.*, 2009) and interchangeably used as well-being, subjective well-being (Nelson, Kushlev *et al.*, 2014; Veenhoven, 2012c) and life satisfaction (Mohanty, 2014; Veenhoven, 2012c) or quality of life (Veenhoven, 2004a; Veenhoven, 2012c).

In social sciences the term happiness is referred to positive psychology (Swami, Stieger *et al.*, 2009) and also, interchangeably, used as well-being and subjective well-being (Grinde, 2012).

Happiness could be a concept that everybody knows the meaning but nobody can afford the definition (Mohanty, 2014). While hedonics define it as a subjective experience of pleasure (Robinson, Kennedy *et al.*, 2012), Kant defended that happiness must be rational and free of personal taint (Ricard,

2003). Marx stated that it is about growth through work (*in* (Ricard, 2003); and for the French philosopher Henri Bergson (Nobel literature prize, 1927) this word means something intricate and ambiguous, one of those ideas which humanity has intentionally left vague, so each individual might interpret it in his/her own way (Ricard, 2003).

In 1789, Jeremy Bentham (in (Veenhoven, 2012b)) came up with a new philosophical concept known as “utilitarianism”, because of the emphasis on the usefulness of behavioral consequences. Bentham, assuming that happiness is something universal (Veenhoven, 2012b), defined happiness, as well as utilitarian philosophers did (Veenhoven, 2011a, 2012c, 2014b), as the “psychological experience of the sum of pleasures and pains” (Veenhoven, 2004a; Veenhoven, 2014b), weighted by the intensity and duration (Rojas & Veenhoven, 2013).

Veenhoven, the director of the World Database of Happiness (Veenhoven, 2013b) defines happiness as “the overall enjoyment of life as a whole positively” (Brulé & Veenhoven, 2014; Nawijn & Veenhoven, 2011; Veenhoven, 2004a; Veenhoven, 2014a, 2014b, 2015a), which means how much people like the life they lead. For Veenhoven, the overall happiness is a synonym for life satisfaction (Veenhoven, 2012c). This definition, according to Veenhoven, has the same sense as Diener had given to the term “subjective well-being” (Veenhoven, 2012b) three decades ago (Veenhoven, 2012c), fitting Bentham’s definition and meaning of happiness (Veenhoven, 2014b).

To Veenhoven, “satisfaction with life” is also called “life satisfaction” and also “happiness” (Nawijn & Veenhoven, 2011; Veenhoven, 2004a; Veenhoven, 2012b). According to him the terms “happiness”, “well-being” and

"quality of life" are synonyms (Nawijn & Veenhoven, 2011; Veenhoven, 2011b, 2012a, 2012b, 2013b, 2015a).

Happiness, an emotion considered by some authors as being as close as a personal trait (Csikszentmihaly & Hunter, 2003; Davidson, 2011), is the frequent experience of a large percentage of positive emotions over time (Lyubomirsky, King *et al.*, 2005), with the absence of negative emotions and displeasure (Gruber, Mauss *et al.*, 2011). It can be defined as an overall appreciation of one's life-as-a-whole (Cohn, Brown *et al.*, 2009; Morinville, Miranda *et al.*, 2013; Veenhoven, 2004b) depending on personal and individual meaning in one's life (Veenhoven, 2008), a composite of life satisfaction, coping resources and positive emotions (Cohn, Brown *et al.*, 2009).

Recent researches showed that it is the relative frequency of positive to negative affect, more than their intensity, which really counts on overall life satisfaction (Rojas & Veenhoven, 2013).

Appreciating one's life as a whole, involves some doubts about whether it may be a cognitive evaluation or an affective experience (Rojas & Veenhoven, 2013).

Happiness includes two emotional components (the affective or hedonic components), which are positive affect - pleasure, and negative affects – displeasure; and one cognitive component, which is life satisfaction, meaning in life and goal attainment (Gruber, Mauss *et al.*, 2011).

For some authors, happiness and life satisfaction are conceptually different, because life satisfaction is a cognitive aspect of happiness (Okulicz-Kozaryn, 2011). In this context "life satisfaction" is mostly used with the meaning of "overall happiness", referring to its cognitive component, also

mentioned by some authors as contentment (Veenhoven, 2014a, 2014d, 2015a).

Veenhoven distinguishes between overall happiness and the components of happiness. These are the affective hedonic components and the cognitive one, he called contentment (Veenhoven, 2014a). To him contentment, which he defined as “the degree to which an individual perceives his/her aspirations are met” (Veenhoven, 2013b) is the cognitive component of happiness (Veenhoven, 2014a, 2014d, 2015a).

As for some authors subjective happiness is associated with the perception of well-being and satisfaction with life (Morinville, Miranda *et al.*, 2013; Swami, Stieger *et al.*, 2009), for some others it is useful to measure life satisfaction apart from happiness (Beuningen, 2012).

According to some others authors (Daniel Kahneman - Nobel Prize in Economic, 2002, and Matthieu Ricard), happiness is most about controlling the mind than the circumstances (Ricard, 2003); is a broad experience of fulfillment, beyond material well-being, a state of mind that includes the experience of joy, contentment, positive well-being and a sense that life is good meaningful and worthwhile (Mohanty, 2014).

Dambrun, Matthieu Ricard *et al.*, (2012,) defined authentic happiness as “an optimal way of being, a state of durable contentment and plenitude or inner-peace”.

For Mathieu Ricard (Ricard, 2003, 2005), Happiness could also be a way of interpret the world (being difficult to change the world, one has always the possibility to change the way to see it), a deep sense of flourishing that arises from an exceptionally healthy mind.

Regardless of the way happiness is defined it is always more than a set of pleasant mood states or an important personally goal. Happiness (SWB) is a human major need (Morinville, Miranda *et al.*, 2013; Parks, Porta *et al.*, 2012). It is a universal emotion, being translated in all languages, and with a world widely known facial expression (Veenhoven, 2004a).

Happiness precedes (Parks, Porta *et al.*, 2012; Sin & Lyubomirsky, 2009) and causes several favorable life outcomes (Boehm, Lyubomirsky *et al.*, 2011; Cohn, Brown *et al.*, 2009; Gruber, Mauss *et al.*, 2011; Mathews & Paulose, 2011; Moljord, Moksnes *et al.*, 2011; Parks, Porta *et al.*, 2012; Robinson, Kennedy *et al.*, 2012; Sin & Lyubomirsky, 2009; Veenhoven, 2013b) predicting quality of life (Nave-Leal, Pais-Ribeiro *et al.*, 2012) and numerous benefits not only for the individual, but also for their families and the community they belong to (Lyubomirsky, Sheldon *et al.*, 2005).

So far, all effects of happiness are positive, supporting Fredrickson's "Broad and build theory" (Veenhoven, 2014c).

Happy people

Happy people have major social rewards, more friends, stronger and richer social relationships and interactions, more energy and productivity (Lyubomirsky, Sheldon *et al.*, 2005), achieve better financial success (Cohn, Brown *et al.*, 2009) and work (Layous, Chancellor *et al.*, 2014; Mohanty, 2014; Robinson, Kennedy *et al.*, 2012).

Happy people tend to have stronger immune system and lower levels of cortisol (Layard, 2005).

Many happy people have rich and satisfactory social relationships (Diener & Seligman, 2002). The social relationships have a great effect both on physical and mental health, affecting all of the well-being related aspects (Argyle, 2001), and helping to protect the mind against to mental aging (Lee, Yoon *et al.*, 2012). Furthermore, they have a positive impact on the immune system (Lee, Yoon *et al.*, 2012) However, their quality is crucial to people's health (Vacharkulksemsuk & Fredrickson, 2012). Research suggests that they could be even more important to well-being than material prosperity is (Diener & Oishi, 2005). Nevertheless, social relationships are necessary but not a sufficient condition for a great happiness (Diener & Seligman, 2002).

The very happiest people also experience unpleasant emotions; they feel happy most of the time, but they rarely feel euphoria or ecstasy. Instead, they feel medium to moderate strong pleasant emotions much of the time (Diener & Seligman, 2002).

Happy people are better citizens and also better informed that unhappy people. They are more involved in social action and more moderate in their political opinions (Veenhoven, 2011a, 2011b). They are also more helpful and more involved in voluntary organization (Veenhoven, 2014c).

Happiness is energizing: it improves activity, creativity (Veenhoven, 2011a, 2013b, 2014c), performance (Veenhoven, 2011b, 2013b, 2014c) and also an open mind (Veenhoven, 2011b, 2013b) with a broader behavioral, building more resources for the future (Veenhoven, 2011a, 2013b).

Happy people have longer life (Cohn, Brown *et al.*, 2009; Cooper, Bebbington *et al.*, 2011; Layard, 2005; Lyubomirsky, Sheldon *et al.*, 2005; Ricard, 2003; Robinson, Kennedy *et al.*, 2012; Veenhoven, 2011a, 2011b, 2013b, 2014c) with better health (Cooper, Bebbington *et al.*, 2011; Damásio,

2003; Nave-Leal, Pais-Ribeiro *et al.*, 2012; Robinson, Kennedy *et al.*, 2012), both physically (Boehm, Lyubomirsky *et al.*, 2011; Cohn, Brown *et al.*, 2009; Lyubomirsky, Sheldon *et al.*, 2005; Nave-Leal, Pais-Ribeiro *et al.*, 2012) and mentally (Cohn, Brown *et al.*, 2009; Gruber, Mauss *et al.*, 2011; Layous, Chancellor *et al.*, 2014; Lyubomirsky, Sheldon *et al.*, 2005; Nave-Leal, Pais-Ribeiro *et al.*, 2012; Robinson, Kennedy *et al.*, 2012).

Happy people show less psychopathologies (Layous, Chancellor *et al.*, 2014). They experience more positive moods, possibly because they have greater cognitive control capacities to regulate negative emotions (Luo, Huang *et al.*, 2014).

Happiness is not only the result of the success, but also the cause for it (Lyubomirsky & Layous, 2013).

Happy people become more satisfied, not only because they feel better, but also because they develop resources for a better living (Cohn, Brown *et al.*, 2009). They make more optimistic judgments (Schulreich, Heussen *et al.*, 2014) and do not tend to ruminate as much as unhappy people (Layous, Chancellor *et al.*, 2014; Luo, Huang *et al.*, 2014; Lyubomirsky, Boehm *et al.*, 2011).

Whereas happy people tend to remember positive events, unhappy people tend to remember the negative events (Cropanzano & Wright, 2001).

Numerous theories had mentioned causes for happiness namely economic factors, adaptation levels, life events and dispositional factors (Lyubomirsky & Lepper, 1999) but there are other factors, like good health, good social relationships, freedom, democracy, lack of tragedy, which in addition with income contribute to happiness (Mohanty, 2014).

Lyubomirsky proposed a model for sustainable happiness (SHM) based on three relevant factors acting all together for happiness: set point, genetically inherited; circumstantial factors of life and the practice of intentional activities (Robinson, Kennedy *et al.*, 2012; Sheldon, Boehm *et al.*, 2012). More precisely, according to her, set point accounts for about 50%, life circumstances for 10% and the intentional activities for the remaining 40% (Lyubomirsky, 2011; Sheldon, Boehm *et al.*, 2012).

Researchers have been considering how important could be the subjective process in happiness (Lyubomirsky & Lepper, 1999) and how it is not exclusively explained by objective determinants but, by a large extent, by an individual attitude (Mohanty, 2014). According to the set point theory, personality is a strong predictor of happiness (Robinson, Kennedy *et al.*, 2012). Attitude and other personality traits depend, among other factors, on the genetics and the nurture a person receives from others. According to a recent study, the attitude can change happiness levels with sustained and deliberate efforts (Mohanty, 2014). A positive attitude, a feature of happy people, is more strongly related to happiness than income is (Mohanty, 2014), and could be improved by education and training in behavioral skills (Mohanty, 2014).

Some scientists are building a bridge between Greek philosophers (as Democritus and Aristotle) concepts on happiness and the modern science, believing that - based on the current knowledge of brain - they can suggest some strategies, not only to improve quality of life and mental health (Grinde, 2012), but also to implement preventive measures for anxiety and depression (Grinde, 2012).

The knowledge about how to change well-being and become happier is still scarce, not only because it is difficult to conduct proper longitudinal and interventional studies, but also because there is a tendency for the researchers to concentrate more on pathology than on the positive mental health (Lyubomirsky, Sheldon *et al.*, 2005).

Positive psychology has promoted happiness as a valuable goal (Bastian, Kuppens *et al.*, 2014). The positive psychology movement, had a great impact in 2000 with Seligman developing a kind of psychology that may simultaneously enhance well-being and relieve depression (Dambrun & Dubuy, 2014).

The intrinsic brain activity is different between happy and unhappy people; unhappy people present some alterations on the brain activity, in some regions, such as, the prefrontal cortex, the temporal lobe, the limbic system and the subcortical regions (Luo, Huang *et al.*, 2014).

Strategies to improve happiness

Happiness is not just the result of a good chance or fortune, or even something that people can buy. Happiness must be prepared, cultivated and defended by each person (Csikszentmihalyi, 2002).

Authors differ on their answer to the question whether it is possible to improve happiness. The answer will be “no” for the defenders of the set point theory (Veenhoven, 2011b, 2013b), for those scientists whom maintain that happiness is largely inborn and embebed in stable personality (Veenhoven,

2011b, 2013b) and for sociologists, that argue that happiness depends on social comparison (Veenhoven, 2011b, 2013b).

However, to Veenhoven “those scientists are wrong, both empirically and theoretically” (Veenhoven, 2013b). According to him, even if there is a clear relation between average happiness and social quality, which can explain, nowadays, 80% of the variation on happiness (Veenhoven, 2011b), happiness is not fixed to a set point (Veenhoven, 2011b, 2013b). Even if people have a genetically happiness set point, that does not mean it will be for sure their destiny, because happiness can be changed for the better (Sheldon, Abad *et al.*, 2010).

Studies on this area show people getting happier through their lifetime (Veenhoven, 2011b, 2013b), others less happy (Veenhoven, 2011b), or getting more satisfied after the age of 50 and decreasing in the years before death (Veenhoven, 2013b).

People live now, on average, more comfortable and longer than kings did in the past (Veenhoven, 2015a), and longer and happier than ever before in human history (Veenhoven, 2015a), with more choices than ever before (Sachs, 2012).

It looks like, that even people may have some limited knowledge about the conditions that make them happy (Ott, 2010), there are several roads to happiness (Whitley & Henwood, 2014). To Veenhoven, happiness can be enhanced by public policy, and also by therapy and education for the personal features (Veenhoven, 2004a). According to Lyubomirsky *et al.* (2005) 40% of the differences in happiness in modern societies are due to intentional individual activities and only 10% are due to circumstances beyond their control (Sheldon, Boehm *et al.*, 2012).

Happiness depends on the choices one makes in life, and also on the ability one has to make choices (Veenhoven, 2011b), which is an art with several skills (Veenhoven, 2011b). To be happy is about to suffering and building well-being (Seligman, 2011a).

There are two main ways in what concerns the improving of the individual happiness: one is about changing one's view towards life (Ricard, 2003) and the other one is changing one's way of life (Nawijn & Veenhoven, 2011).

40% of the variance in happiness is probably caused by intentional activity seeming to be determined by what people do (Lyubomirsky, 2011; Nawijn & Veenhoven, 2011; Sheldon, Boehm *et al.*, 2012), which can possibly change the way one's live (Nawijn & Veenhoven, 2011). Only 10% of the variance is due to unintentional activity (Nawijn & Veenhoven, 2011; Sheldon, Boehm *et al.*, 2012).

Researches pointed to empirical and theoretical evidences that state that the individual happiness could be increased through some intentional activities (Boehm, Lyubomirsky *et al.*, 2011; Kurtz & Lyubomirsky, 2013; Layous, Chancellor *et al.*, 2014; Layous, Chancellor *et al.*, 2011; Layous, Nelson *et al.*, 2012; Lyubomirsky, 2011; Lyubomirsky & Layous, 2013; Schueller & Parks, 2014; Sin & Lyubomirsky, 2009).

Nevertheless, leisure is an important cause (Argyle, 2001). Although having a positive correlation with happiness, some activities, like holiday trips, which are the leisure activities with the largest correlation to happiness, (Nawijn & Veenhoven, 2011) will have a briefly lived effect – after a year is hardly visible (Nawijn & Veenhoven, 2011).

There is a growing scientific evidence on functional and structural changes in the brain as a consequence of specific interventions and work training (Davidson & Mcewen, 2012; Davidson & Schuyler, 2015). Happiness can be increased by simple, but intentional changes in one's thought and behavior (Lyubomirsky, 2011; Lyubomirsky & Layous, 2013), such as, by having physical activity (Moljord, Moksnes *et al.*, 2011), listening to music - with large scientific evidence by neuroimaging techniques (Morinville, Miranda *et al.*, 2013), meditating - a relevant exercise for the brain (Grinde, 2012) with the intention of enhance happiness (Gruber, Mauss *et al.*, 2011; Ricard, 2003), by implementing ethical attitudes (Ricard, 2003), or by doing cognitive therapy - another way of strength brain structures (Grinde, 2012).

The cognitive terapy (CT) developed fifty years ago by Aaron Beck (Beck, 2005; Disner, Beevers *et al.*, 2011; Knapp & Beck, 2008) is based on the principle that depressed individuals can learn how to identify and change their negative thoughts in their daily life (Detweiler-Bedell & Salovey, 2003; Knapp & Beck, 2008). CT counts on that cognitive change will generate behavioral change and vice versa (Knapp & Beck, 2008). Furthermore, the brain may be changed by training it with new habbits of thinking (Fredrickson, 2010). The cognitive behavioral therapy (CBT) has been shown to be effective in reducing symptoms of several psychiatric disorders (Beck, 2005; Knapp & Beck, 2008). The CBT is not only highly effective and a durable treatment for some psychiatric disorders such as depression (Disner, Beevers *et al.*, 2011), but it is also a treatment for some physical conditions (Knapp & Beck, 2008).

Practicing gratitude, optimism and acts of kindness are examples of typically positive attitudes that characterize happy people: brief, simple,

accessible and not requiring financial resources (Layous, Chancellor *et al.*, 2014; Layous, Chancellor *et al.*, 2011; Lyubomirsky & Layous, 2013). Furthermore, there is a strong evidence that increases happiness (Layard, Clark *et al.*, 2012; Sachs, 2012).

Veenhoven reports, in his most recent paper (Veenhoven, 2012c, 2015a), that over the last decade, average happiness has risen in the most developed nations; so, he concludes, there is a possibility to create greater happiness for a great number.

However, it must be emphasized the importance of the effort and engagement (Steger, Kashdan *et al.*, 2008), with both cognitive effortful and behavioral strategies (Kurtz & Lyubomirsky, 2013), step by step (Ricard, 2005), in order to develop long lasting well-being (Steger, Kashdan *et al.*, 2008). This is not a brand new concept, insofar as Seneca recommended it in “Letters to Lucilio”, stressing, as well as Ricard did (Ricard, 2005), that the real happiness starts within people, in the best part of themselves (Séneca, 1965). As Damásio mentioned, William James used to label humam being in two different groups: those who are plenty of enthusiasm and the others with sick spirit (Damásio, 2003).

The very last World Happiness Report ("World happiness report," 2015), underscored four holds-up structures (not usually emphasized) for well-being: sustained positive emotions; the capacity to recover from negative emotions; the altruism, empathy and pro-social behavior and the mindfulness (i.e. to be aware) of emotions (Davidson & Schuyler, 2015; Helliwell, Layard *et al.*, 2015). In this report ("World happiness report," 2015), Davidson *et al.* (2015] consider happiness different from well-being: while happiness could

be momentary and short-lived, well-being could be everlasting (Davidson & Schuyler, 2015).

According to the neuroscientists, all the neural circuits involved in well-being have the capacity to grow and change, which could happen unintentionally or by intentional mental training (Davidson & Schuyler, 2015).

The neuroscience supports, with the help of fMRI, that even if happiness has multiple brain regions involved, it is the prefrontal cortex the key component of the circuit that implements positive and negative affects (Luo, Huang *et al.*, 2014).

However, plasticity on neuronal circuits related to well-being can be shaped or cultivated by mental training, such as psychotherapy and meditation (Davidson & Schuyler, 2015).

Neuroscientists working on the neural network for happiness (Grinde, 2012) defend that the nerve circuit can be enhanced by the appropriate brain exercise, which will improve and strengthen their structure (Grinde, 2012), the same way muscles improve upon exercise (Grinde, 2012). Any form of mental training can modify the brain, both on function and structure (Ricard, 2015). Through mental training, people can intentionally change their brain and modify their emotional style (Davidson & Begley, 2013).

In summary, the authors concluded that happiness and well-being are both skill that can be strengthened by training (Helliwell, Layard *et al.*, 2015).

Some strategies to improve happiness are:

- To enhance good individual social relationship (Davidson & Schuyler, 2015; "World happiness report," 2015). The quality of individual social relationship is one of the strongest predictors of well-being (Davidson & Schuyler, 2015). On the

contrary, social isolation and physical pain activate the same brain region (Davidson & Schuyler, 2015).

- Altruism and pro-social behaviors (Davidson & Schuyler, 2015; "World happiness report," 2015), which are shown to be consistent across cultures ("World happiness report," 2015). Altruism is relate to happiness (Ricard, 2013). Pro-social behavior is also correlated with better health and longer life expectancy, which also contributes itself to the well-being (Davidson & Schuyler, 2015; Fredrickson, 2010; "World happiness report," 2015). In addition, people who care about others never felt themselves alone (Damásio, 2003)
- Preventive measures should be applied mainly in children - counting on the fact that one third of the current world population is now under 18 years old. From the three most important features for children's development - academic, behavioral and emotional - the best predictor of life satisfaction is the emotional one, followed by the behavioral and finally, by the academic one (Helliwell, Layard *et al.*, 2015; "World happiness report," 2015).

Fluctuation

Happiness changes over time (Lyubomirsky, 2011). It varies according to the activities, partners, life events, personal tragedies, good luck, illness (Csikszentmihaly & Hunter, 2003; Oishi, Diener *et al.*, 2007), and work

(Robinson, Kennedy *et al.*, 2012), with a fluctuation depending on the days and weeks (Csikszentmihaly & Hunter, 2003; Dambrun, Ricard *et al.*, 2012; Oishi, Diener *et al.*, 2007), mood and interpretations (Veenhoven, 2012c). Mood is (as well as cognition and memory) related to weather conditions and sunlight; it seems that sunlight has immediate effect on mood and serotonin levels, whether people are depressed or not (Gable, Impett *et al.*, 2004).

Happiness significantly varies across the week and the day (Csikszentmihaly & Hunter, 2003; Dambrun, Ricard *et al.*, 2012) with some cross-cultural differences (Swami, Stieger *et al.*, 2009). High emotional variability in a relatively short time, even if they are positive emotions, are associated to worse psychological health, decreased levels of satisfaction with life and subjective happiness and increased levels of depression and anxiety (Gruber, Kogan *et al.*, 2013).

There is a slight agreement, with some antagonistic conclusions, on how happiness varies throughout life (Vera-Villarroel, Atenas *et al.*, 2012). Whereas for some authors happiness is quite variable over lifetime, not being like a trait (Veenhoven, 2004b), for some others there is a genetic predisposition to be happy or unhappy with some changes over time, influenced by fortune or adversity (Diener, Suh *et al.*, 1999).

No life is without stress or adversity (Csikszentmihalyi, 2002; Lyubomirsky, 2011); but the way people react to momentary crisis may have effects across life (Lyubomirsky, 2013) and establish how troubled they will be (Csikszentmihalyi, 2002).

According to the set point theory each person has his/her own level of happiness to which they return after positive and negative experiences (Robinson, Kennedy *et al.*, 2012; Sheldon, Abad *et al.*, 2010), ranging from

high to lower levels (Lyubomirsky, Sheldon *et al.*, 2005; Robinson, Kennedy *et al.*, 2012). This individual and personal genetically determined level (Lyubomirsky, Sheldon *et al.*, 2005) is an innate characteristic which is not easily changeable (Mohanty, 2014).

The role of some demographic factors

Age

Several studies have been focused on how age may influence happiness (Bhattacharjee & Mogilner, 2014), but looks like there is no consensus about the way age relates with it (Vera-Villarroel, Atenas *et al.*, 2012).

Some authors pointed age as an important factor (Csikszentmihaly & Hunter, 2003), with high levels of happiness being experienced before twenties and after fifties (Vera-Villarroel, Atenas *et al.*, 2012). Some others reported that happiness in late adulthood is as high, or even higher, than it is in early adulthood (Lacey, Kierstead *et al.*, 2012). And there are also studies concluding that happiness is unaffected by age, if people have an active and sociable lifestyle (Lacey, Kierstead *et al.*, 2012).

Across the world, it seems that differences on average are very small regarding age (Fortin, Helliwell *et al.*, 2015).

Older people tend to define happiness in terms of calm, peacefulness and low arousal, emphasizing the relationships already existing, emotional fulfillment, calming and familiar choices. Younger people define happiness in terms of enthusiasm, excitement and high states of arousal, pursuing happiness through new social interactions and information and with unfamiliar and exciting choices (Bhattacharjee & Mogilner, 2014). Older people may be more psychological mature than younger and consequently be happier (Sheldon & Kasser, 2001).

The aging positivity effects support that, despite cognitive and physiological declines, older people are happier than younger people (Bastian, Kuppens *et al.*, 2014).

Marriage and Gender

Happiness has been associated with marriage (Cooper, Bebbington *et al.*, 2011), in a clearly universal pattern across nations (Veenhoven, 2012b). However, the importance of marriage is still under debate, because people return to baseline levels of satisfaction a couple of years after marriage (Davidson, 2011; Helliwell, Huang *et al.*, 2015). It seems that the great happiness following marriage only lasts for about two years (Lyubomirsky, 2013), and that five years later people will be less happier than they were at the moment they married (Davidson, 2011). To put it briefly, being married can be a source of life satisfaction (Boonstra, Reneman *et al.*, 2013), if it happens to be a good marriage; albeit, if the least happy married people get

divorced they will achieve higher and long lasting levels of happiness than before (Layard, Clark *et al.*, 2012; "World happiness report ", 2012).

There is no consensus for the way gender relates to happiness (Vera-Villarroel, Atenas *et al.*, 2012) with no significant differences on several studies (Csikszentmihaly & Hunter, 2003; Fortin, Helliwell *et al.*, 2015; Vera-Villarroel, Atenas *et al.*, 2012; "World happiness report," 2015). Nevertheless, the analysis using the entire collected data done by the Gallup World Poll, between 2005 and 2014, covering around 160 different countries or nations ("World happiness report," 2015), on a global average, life evaluations are slightly higher for women, starting with high levels among youngers, which usually fall when they reach middle age- with considerable differences related to regions (Helliwell, Layard *et al.*, 2015; "World happiness report," 2015).

To some extent, happiness is independent of age, marital status, physical health (Veenhoven, 2008) and gender (Moljord, Moksnes *et al.*, 2011), depending on the choice we have done in life and on the capacity one have to make choices (Veenhoven, 2008). However, the social context is tightly important in the analysis by gender and age across the world (Fortin, Helliwell *et al.*, 2015; "World happiness report," 2015). Women report higher levels of satisfaction and happiness in most advanced countries and in those with more equal gender rights (Layard, Clark *et al.*, 2012; "World happiness report ", 2012).

Countries

People differ in Happiness (Veenhoven, 2012c) (Brulé & Veenhoven, 2014). The average happiness differs markedly across nations (Brulé & Veenhoven, 2014; Brulé & Veenhoven, 2014; Veenhoven, 2004a; Veenhoven, 2011b, 2012a, 2012b, 2012c, 2013b; "World happiness report ", 2012; "World happiness report ", 2013; "World happiness report," 2015) and between citizens within countries (Veenhoven, 2012c).

Since the second half of the 20th century happiness raised slightly and life expectancy grown considerably in most of the developed nations (Veenhoven, 2013a).

Although average happiness greatly differs across nations, taking data all together, the result is optimistic (Veenhoven, 2012c). People tend to enjoy their lives once conditions are tolerable; they are only typically unhappy when their conditions of life are miserable (Veenhoven, 2012c). No nation is happier in all measures of prosperity and well-being but there are some nations, such as Denmark which has been topping the high scores of happiness (Diener, Ng *et al.*, 2010; Sachs, 2012; "World happiness report ", 2012). See also Appendix 10.

Most people are happy but depending on life circumstances and on cultural and individual variances there are differences across nations (Biswas-Diener, Vittersø *et al.*, 2005). See also Appendices 8, 9 and 10.

Recently the world's average for happiness was about 5.5 (Veenhoven, 2011a, 2011b) but now is about 6 (Veenhoven, 2013b), on a 0 to 10 scale (Veenhoven, 2011b). See Apendix 8.

Conditions for happiness seem to be similar across the world (Veenhoven, 2012b). The differences on happiness across nations are

consistently related to some specific social characteristics (Veenhoven, 2011a), such as political democracy, economic development and female emancipation (Brulé & Veenhoven, 2014). Government policy can largely influence happiness (Layard, Clark *et al.*, 2012; Layard & O'donnell, 2015). Therefore, people live happier in the most modern nations, especially those characterized by economic development, freedom, rule of law and good governance which may explain 75% of the national differences in average happiness (Veenhoven, 2012b). Good governance is a universal prerequisite for happiness (Veenhoven, 2011b; "World happiness report ", 2012). The average happiness is markedly lower in nations where women are discriminated (Veenhoven, 2012b; "World happiness report ", 2012).

There is also a strong correlation between perceived freedom and happiness, all over the world (Layard, Clark *et al.*, 2012; Veenhoven, 2012b) (Veenhoven, 2004a).

Happiness is higher in rich nations (Veenhoven, 2004a), nations with freedom (Layard, Clark *et al.*, 2012; Veenhoven, 2004a; Veenhoven, 2012b), with modernity and cultural plurality" (Veenhoven, 2004a); and in those where human rights are respected (Veenhoven, 2011b, 2012b; "World happiness report ", 2012).

Most people are happy at least in modern society (Veenhoven, 2011b), with a prevalent pattern of high contentment and affect (Veenhoven, 2014d). The average happiness in developed nations is about 7.5 in a 0-10 scale (Veenhoven, 2015a), leading Veenhoven to conclude that the more modern the country is, the happier citizens are (Veenhoven, 2012c). However, there are some countries, such as, Argentine ranging 7.0, which is quite close to the top ten happiest countries (Veenhoven, 2007). See also Appendices 8 and 9.

In fact, the average on life satisfaction for Latin America is higher than it could be predicted for those countries, which has being explained by cultural differences and some characteristic features of family and social life in Latin countries (Helliwell, Huang *et al.*, 2015; "World happiness report," 2015).

Unhappiness is prevalent in third-world nations, where a large part of the population live at subsistence levels (Veenhoven, 2013b). See also Appendix 10.

People live less happy in nations where corruption is common (Veenhoven, 2011b, 2012b), even were favoritism is seen as a moral obligation (Veenhoven, 2012b).

Africans rate their life close to the worst possible (Veenhoven, 2014d).

The world's global average as regards happiness has increased in most modern nations over the last 40 years (Veenhoven, 2012a), becoming slightly happier ("World happiness report ", 2013).

Based on the fact that happiness has increased, even in happiest societies like Denmark, meaning that even a greater gain is possible in other nations, Veenhoven (2012) claims that it is possible to have greater happiness for a greater number of persons (Veenhoven, 2011b, 2012a).

In summary, and according to the first World Happiness Report (2012), capital income, healthy life expectancy, friends to count on, sense of freedom to make life choices and the absence of corruption explain more than 95% of the differences ("World happiness report ", 2012), for samples of 1000 respondents from more than 150 countries. On the WHR 2015, the authors underscored the same variables plus generosity to explain 75% of differences between countries ("World happiness report," 2015), emphasizing the social

support, income and healthy life expectancy as being the three most important factors (Helliwell, Huang *et al.*, 2015; Helliwell, Layard *et al.*, 2015).

For more details abou Happiness across nations, see Appendix 8, Appendix 9 and Appendix 10.

Religiosity and Friends

Worldwide, 68% of adults reported that religion is important in their daily lives. Furthermore, and according to the cross-country analysis of the Gallup World Poll, a weekly church attendance has positive effects on well-being, at national level (Layard, Clark *et al.*, 2012; "World happiness report ", 2012).

Happiness has been associated with religious involvement (Cooper, Bebbington *et al.*, 2011). Approximately 75% of the studies found that religious involvement has a positive effect on well-being, especially in those difficult life moments such as bereavement, job loss or marital problems/issues (Layard, Clark *et al.*, 2012; "World happiness report ", 2012).

Religiosity improves well-being by providing the sociocultural context for meaning and beliefs in a society, and by providing individual values and social norms (Layard, Clark *et al.*, 2012; Okulicz-Kozaryn, 2011).

There is a low but consistent relationship between religiosity and happiness / satisfaction with life (Robinson, Kennedy *et al.*, 2012). In religious countries, religious people are happier than nonreligious ones (Okulicz-Kozaryn, 2011).

Happiness has been associated with family and social support (Cooper, Bebbington *et al.*, 2011; Layard, Clark *et al.*, 2012). The relationship with family and friends is strongly related to happiness in terms of quality, not in terms of quantity (Robinson, Kennedy *et al.*, 2012).

Individual happiness also depends on the happiness of whom people are connected (Robinson, Kennedy *et al.*, 2012): being with friends rates high levels of happiness; being alone corresponds to lowest levels (Csikszentmihaly & Hunter, 2003; Diener, Ng *et al.*, 2010),

Perceived social support (the perception of being loved, valued, esteemed and able to count on others) is positively associated with high levels of happiness, physical and mental health and longevity (Orkibi, Ronen *et al.*, 2014). Indeed, social support is one of the major benefits that close relationships have (Gable, Impett *et al.*, 2004).

Income/ Money

The relation between happiness and levels of wealth conducted to several question from both academic and lay people, resulting in several studies (Diener, Ng *et al.*, 2010; Hsee, Yang *et al.*, 2009). In fact, there are many theories but little scientific agreement about the interaction money has with happiness (Vera-Villarroel, Atenas *et al.*, 2012).

The relationship between income and happiness can be complex (Wang & Murnighan, 2014). Myers and Diener compare the relation between income and health with happiness: if they are missing, it means misery; but to have them, there is no guarantee of being happy (Myers & Diener, 1995).

Income allows people to fulfill their physical needs; money can bring people status and respect (Diener, Ng *et al.*, 2010). But, an absolute income does not determine happiness (Robinson, Kennedy *et al.*, 2012; Sachs, 2012; "World happiness report ", 2012) except in developing countries, because income and happiness are related for those living in poverty (Robinson, Kennedy *et al.*, 2012). The happiest countries are the high-income ones with a high degree of social quality, trust and quality of governance ("World happiness report ", 2012).

Subjective and economic WB are one of the most important part of the individual daily life (Wang & Murnighan, 2014), but people rank happiness ahead of money as a life goal (Diener & Seligman, 2004).

People in wealthy nations are happier than those in poor nations but, within nations there is a positive but small relation between income and happiness (Diener, Ng *et al.*, 2010).

The relation between more income and satisfaction with life is not linear (Argyle, 2001; Johnson & Krueger, 2006); longitudinal studies suggest that there are both directions with higher satisfaction contributing to higher income as well (Johnson & Krueger, 2006) with some recent evidences suggesting a positive relationship between income and happiness (Bhattacharjee & Mogilner, 2014; Mohanty, 2014).

Even though income is not the most important factor for happiness it still has a strong positive impact on life evaluation (Layard, Clark *et al.*, 2012; "World happiness report ", 2012). It is indispensable for well-being until the basic survival needs have been attended (Mohanty, 2014). After the basic economic needs have been met, money only brings small improvements in happiness (Diener & Seligman, 2004) because people will focus on some

others as intrinsic motivation and psychological needs (Wang & Murnighan, 2014).

Easterlin concludes that “today, as in the past, within a country at a given time those with higher incomes are, on average, happier. However, raising the incomes of all does not increase the happiness of all” (Easterlin, 1995). The reason is because material aspiration increases with the society income (Easterlin, 1995), people evaluate their incomes by social comparison (Diener, Ng *et al.*, 2010; "World happiness report ", 2012) and material desires will require higher financial resources (Johnson & Krueger, 2006). Over time society does not become happier, just because it has become richer; there are other important social factors besides money, such as security, trust in the government and social trust, which are important to happiness ("World happiness report ", 2012).

A practical example for Easterlin paradox (1976) is the fact that although the income per head had doubled in the US, the average happiness remained in the same level (Veenhoven, 2015a). On the contrary, Veenhoven have a different opinion concluding on his studies that happiness has risen in most nations (Veenhoven, 2015a).

Money supports the access to some important resources to enhance happiness and well-being but *de per se* money is not a reliable source to reach happiness and WB (Ryan & Deci, 2001). After satisfying the basic needs, there are other factors over income which promote happiness (Mohanty, 2014). As a matter of fact, it seems that those who put too much emphasis on higher income are, on average, less happy and more vulnerable to psychological disorders (Sachs, 2012; "World happiness report ", 2012).

As happiness is a psychological feeling it can not be exclusively explained by objective determinants (Mohanty, 2014). Individual personal happiness is positively related not only to material well-being (income) but also to positive psychological attitude (Mohanty, 2014).

Biological needs are demanding and coming as the first motivation for people. But, recently, there have been some studies pointing out psychological needs (such as autonomy, competence, social relationships, purpose in life, personal growth) beyond physical ones (Diener, Ng *et al.*, 2010).

For some authors (Ricard, 2013), money has a weak relationship with happiness. It is the individual attitude that determines, by a large extent, the personal happiness (Mohanty, 2014).

Some authors suggest that the feeling of happiness (SWB) may improve ethical behavior, as well as, corrupted behavior may lead to less collective happiness (Wang & Murnighan, 2014).

Spending money on oneself is unrelated to happiness, but higher pro-social spending is associated with significantly greater happiness; intentional activities are another route to lasting happiness (Dunn, Aknin *et al.*, 2008).

The idea that social engagement tends to result in a more satisfying life is a classic belief that still applies today (Veenhoven, 2014b).

According to Self-centeredness/Selflessness Happiness Model (SSHM) if the attainment of happiness is particularly self-centered, it would favor fluctuating happiness, characterized by the repeatedly alternation of positive and negative phases of pleasure and displeasure (Dambrun, Ricard *et al.*, 2012).

In a self-centered happiness, self became quite important. Individuals feel motivated to avoid displeasure and obtain pleasure, leading to a transitory satisfaction dependent from the presence of specific stimulus and circumstances. Besides, the occasional impossibility to attain some objectives, it could lead to some afflictive affects like frustration, anger or jealousy and disturb well-being (Dambrun & Ricard, 2011; Dambrun, Ricard *et al.*, 2012). By hedonic adaptation this unstable happiness, soon will became neutral, and repeatedly the self-centeredness will try to maximize pleasures and avoid displeasures inducting, this way, a fluctuating happiness (Dambrun & Ricard, 2011; Dambrun, Ricard *et al.*, 2012).

According to the Self-centeredness/Selflessness Happiness Model (SSHM), if the attainment of happiness is selflessness, it will be closely linked to authentic-durable happiness, characterized by meaning and engagement, intrinsic and pro-social values, gratitude wisdom and selflessness (Dambrun & Ricard, 2011). For the authors of SSHM, all this characteristics are simultaneously antecedents and consequences of authentic-durable happiness which they define as a state of durable contentment and plenitude or inner-peace, an optimal way of being (Dambrun, Ricard *et al.*, 2012).

Most common scales for assessment of happiness

Survey research is the most widely used method used in social sciences to study happiness (Dejonge, Veenhoven *et al.*, 2014). Worldwide different experts, such as psychologists, economists, anthropologist and

neuroscientists are now requiring methods to measure happiness (Diener & Seligman, 2004).

The first survey on happiness was developed in USA in 1946 (Veenhoven, 2012a). Nowadays survey results on happiness are available in almost all nations of the world in the World Database of Happiness (WDH) in the collection “Happiness in Nations”(Veenhoven, 2012a) and in The World Happiness Reports ("World happiness report ", 2012; "World happiness report ", 2013; "World happiness report," 2015).

Happiness can be measured using questionnaires (Csikszentmihaly & Hunter, 2003; Veenhoven, 2008; Veenhoven, 2014f, 2015b). Notwithstanding being a subjective experience, happiness can also be related to brain functions (Sachs, 2012; "World happiness report ", 2013).

Most of the literature on happiness and income uses happiness and life satisfaction measures interchangeably (Jayawickreme, Forgeard *et al.*, 2012).

In the World Happiness Reports (WHR), the average happiness across nations is based on some other domains than just well-being ("World happiness report ", 2012). The World Happiness Reports consider health, education levels, social support, freedom, perception of corruption, income as well as satisfaction with life and well-being all together as determinants ("World happiness report ", 2012).

Several and different measures on happiness have been used in survey studies worldwide and can be assessed in the collection “Measures of Happiness”, on World Database of Happiness (Brulé & Veenhoven, 2014).

There had been developed many scales to assess happiness and well-being (Dambrun, Ricard *et al.*, 2012). Among others, (Nelson, Kushlev *et al.*, 2014), can be mentioned as examples:

a) The ones based on a subjectivist approach (Lyubomirsky & Lepper, 1999; Swami, Stieger *et al.*, 2009), such as the Subjective Happiness Scale (SHS), a 4-items measure for a global measure of subjective happiness (Howell, Chenot *et al.*, 2011; Lyubomirsky & Lepper, 1999; Nelson, Kushlev *et al.*, 2014; Ribeiro, 2012; Swami, Stieger *et al.*, 2009), developed in 1999 by Lyubomirsky and Lepper (Lyubomirsky & Lepper, 1999);

b) Those to assess general happiness considering its aspects of pleasure, engagement and meaning, as the Authentic Happiness Inventory (AHI); it is a 24-items scale developed by Seligman *et al.* (Parks, Porta *et al.*, 2012). Its short form, the Orientations to Happiness Questionnaire (OTH), is a 18 items self-report questionnaire consisting of three scales (Ruch, Harzer *et al.*, 2010; Ruch, Martínez-Martí *et al.*, 2014), developed by Peterson (Peterson, Park *et al.*, 2005; Ruch, Martínez-Martí *et al.*, 2014);

d) The one single question largely used all over the world by several authors, in several countries (Cooper, Bebbington *et al.*, 2011; Lyubomirsky & Lepper, 1999; Veenhoven, 2004a; Veenhoven, 2011a, 2013a, 2014a, 2015a, 2015b). According to Veenhoven this single direct question, the most commonly used question all over the world (Veenhoven, 2012a), is a common practice and the happiness can be measured by it (Veenhoven, 2004a; Veenhoven, 2015a);

e) The Satisfaction With Life Scale (SWLS) also applied in this study (see Measures, Chapter II) mentioned by Ruut Veenhoven as being the most frequently used questionnaire to measure happiness (Veenhoven, 2014f), and that has been used with this purpose by several authors (Sato & Yuki, 2014); and

f) The Gross National Happiness (GNH), the Bhutan Index, which is a relevant measure for policy and meant to guide people and nations towards happiness. The GNH is a multidimensional measure, with 124 variables grouped into 33 indicators, providing an insight into 9 different domains considered to be equally valid for happiness ("World happiness report ", 2012). The aim of the GNH is the pursuit of collective happiness, not the subjective well-being, focused on oneself ("World happiness report ", 2012).

The degree of happiness could be strongly affected by the construction of the scale; so, some authors recommend more advanced scale transformations methods to effectively give researchers the ability to synthetize results (Dejonge, Veenhoven *et al.*, 2014).

To Dambrun, Matthieu Ricard *et al.* none of the existing scales to assess happiness and well-being seemed to focus on durables contentment and inner-peace that characterized authentic-durable happiness (Dambrun, Ricard *et al.*, 2012). In 2012 they developed two new measure to assess different facets of human happiness and subjective authentic-durable happiness (Dambrun, Ricard *et al.*, 2012).

Subjective Fluctuating Happiness Scale (SFHS) was developed as a scale to measure perceived fluctuating degrees of happiness (Dambrun, Ricard *et al.*, 2012) and Subjective Authentic-Durable Happiness Scale (SA-DHS), was developed with the main purpose to give rise a valid instrument to access subjective authentic-durable happiness (Dambrun, Ricard *et al.*, 2012).

These two new scales (SFHS and SA-DHS) developed by Michael Dambrun et al. (2012) are closely linked to the recent theoretical Self-centeredness/ Selflessness Happiness Model – SSHM, from Michael

Dambrun and Matthieu Ricard (Dambrun & Ricard, 2011). According to this theory a self-centered position gave too much emphasis to the self, leading to hedonic principles where individuals are motivated to obtain pleasure and avoid displeasure to create a feeling of pleasure, joy and transitory satisfaction. On this model, obtaining pleasure and avoiding displeasure depends on circumstances, is unstable and tend to became neutral (Dambrun, Ricard *et al.*, 2012), according to hedonic treadmill theory (Dyrdal, Roysamb *et al.*, 2011; Lyubomirsky, 2011, 2013; Parks, Porta *et al.*, 2012; Sheldon, Boehm *et al.*, 2012). Self-centeredness, characterized by this constant and repetitive effort to maximize pleasure and avoid displeasure, induces a fluctuating happiness (Dambrun & Ricard, 2011; Dambrun, Ricard *et al.*, 2012), characterized by an alternation of positive and negative phases (Dambrun, Ricard *et al.*, 2012).

From the explained above and bearing in mind that, as far as it can be concluded from the bibliographic search, there are no published study about the eventual correlation between fluctuating and authentic-durable happiness with stress or with the musculoskeletal disorders (MSD) among general population or among dentists, it would be important and relevant to develop studies to evaluate those correlations.

Furthermore, as the scales to evaluate fluctuating and authentic-durable happiness, the SFHS and SA-DHS respectively, are not yet validated for Portuguese language, it would be important the validation of these scales for Portuguese people.

CHAPTER II

VALIDATION OF SUBJECTIVE HAPINESS SCALES ON PORTUGUESE PEOPLE, STUDY1

OBJECTIVES

1. To validate for Portuguese population the Subjective Fluctuating Happiness Scale (SFHS)

2. To validate for Portuguese population the Subjective Authentic-Durable Happiness Scale (SA-DHS)

TYPE OF STUDY

This is an observational cross-sectional survey type of study.

METHODOLOGY

Procedures

Ethical Considerations / Permission from the authors

Permission for translation and validation of the original scales, Subjective Fluctuating Happiness Scale (SFHS) and Subjective Authentic-Durable Happiness Scale (SA-DHS), was granted by one of the authors, Professor Michael Dambrun, from *Laboratoire de Psychologie Sociale et Cognitive, CNRS,* Clermont Université, Université Blaise Pascal, Clermont-Ferrand, France (Dambrun, Ricard *et al.*, 2012).

Translation

Once permission was obtained, the SFHS and the SA-DHS were translated into Portuguese.

Translation into Portuguese was made by two Portuguese teachers who had resided in the USA and Canada for over 30 years and, thus, fluent in both languages.

One single Portuguese previous version was done with the cooperation of both translators. This previous Portuguese translation was back translated into English by two others individuals; one is a Portuguese psychologist living in Canada and the other an American with expertise in psychology and philosophy living in Portugal, both fluent in both languages.

The final Portuguese version read in this investigation was obtained by collaborative efforts from all four translators along with clarification from the principal investigator of the scales.

Original Scales

The scales are introduced by the phrase “Bellow is a collection of statements. Using the 1-7 scale, please read each statement carefully and then indicate how much you agree or disagree by circling the number which best corresponds to what you think”, with the explanation that number 1 corresponds to strongly disagree and number 7 to strongly agree.

Subjective Fluctuating Happiness Scale (SFHS)

In my life…

1. I have had satisfactions and also great disappointments
2. The periods of pleasure that I have known are always followed by periods of displeasure

3. My level of serenity is very changeable
4. I have often known periods of euphoria but they are almost always followed by much less exciting periods
5. I often go from euphoria to sadness
6. Periods of ill being follow periods of well-being
7. My level of happiness is rather unstable, sometimes high, and sometimes low
8. I often go from a rather high level of pleasure to a rather low level of pleasure
9. I have times when I swing from moments of total bliss to much less satisfying moments
10. In the same day, I can sometimes be happy and sometimes sad

Subjective Authentic-Durable Happiness Scale (SA-DHS)

In your life, what is your regular level of…

1. Overall well-being?
2. Happiness?
3. Pleasure?
4. Bliss (seemingly complete happiness)?
5. Peace of mind?
6. Satisfaction?
7. Serenity?
8. Displeasure?

9. Beatitude (perfect happiness)?
10. Inner peace?
11. Fulfillment?
12. Joy?
13. Feeling bad?
14. Tranquility (inner-calm)?
15. Plenitude (feeling of complete satisfaction, happiness and fulfillment)?
16. Unhappiness?

Final Portuguese Scales

The scales were introduced by the phrase *"Para cada uma das afirmações, indique a opção que melhor se adapta a si, colocando uma cruz no rectângulo correspondente".*

Escala de Felicidade Subjetiva Flutuante, Instável

Ao longo da minha vida…

1. Tenho tido satisfações e também grandes desilusões

2. Os períodos de prazer que tenho tido são sempre seguidos de período de descontentamento

3. O meu nível de serenidade é muito variável.

4. Tenho tido períodos de euforia mas são quase sempre seguidos por períodos muito menos excitantes.

5. Mudo muitas vezes de euforia para tristeza.

6. Períodos de mal-estar seguem períodos de bem-estar.

7. O meu nível de felicidade é bastante instável, algumas vezes alto, outras baixo.

8. Passo muitas vezes de um alto nível de prazer para um baixo nível de prazer.

9. Tenho períodos em que mudo de um momento para o outro de extrema felicidade para momentos muito menos satisfatórios.

10. No mesmo dia estou feliz e outras vezes triste.

Escala de Felicidade Subjetiva Autêntica e Estável

Na sua vida, qual o seu nível regular de...

1. Bem-estar geral?

2. Felicidade?

3. Prazer?

4. Êxtase (felicidade que parece completa)?

5. Paz de espírito?

6. Satisfação?

7. Serenidade?

8. Descontentamento?

9. Beatitude (Felicidade perfeita)?

10. Paz interior?

11. Realização total?

12. Alegria?

13. Sentir-se mal?

14. Tranquilidade (calma interior)?

15. Plenitude (Sensação de satisfação absoluta, felicidade, realização total)?

16. Infelicidade?

Pilot test, Study1

A pilot study was conducted prior to the final investigation to validate the instruments of subjective happiness.

Sample, pilot test

The sample for the pilot study consisted of a convenient sample of 40 individuals, who differed regarding age, literacy and educational level. Respondents were also asked to make comments and suggestions on a separate page.

Measures, pilot test

To validate the Subjective Happiness Scales, simultaneously with the Portuguese versions of the Subjective Happiness Scales (SFHS and SA-DHS), two other measures of Well-Being were used: Positive and Negative Affect Scale (PANAS) and the Satisfaction With Life Scale (SWLS).

Ethical considerations, pilot test

Permission for translation and validation was granted from the authors of the original Subjective Happiness Scales (Dambrun, Ricard *et al.*, 2012).

Permission to use the Portuguese validation of PANAS (Galinha & Ribeiro, 2005a, 2005b) and SWLS (Simões, 1992) was granted by the authors.

Participants were informed on the first page about the identity of the researchers, the facultative and anonymous character of their participation and how their response would be analyzed, for scientific and academic purposes only.

Results, pilot test

Table 1. Internal Consistency, Pilot test

Scale		Cronbach's alpha (α)
SFHS, full scale		.88
SA-DHS, Full scale		.92
SA-DHS,	Contentment sub-scale (8 items)	.87
	Inner Peace sub-scale (5 items)	.89

The reliability value, Cronbach's alpha, for all 10 items of SFHS was 0.88.

For SA-DHS the reliability value was 0.92 for all 13 items.

For Contentment Sub-dimension (8 items) Cronbach's alpha was 0.87; and for Inner Peace sub-dimension (5 items) the value was 0.89.

Main Study (Study1)

The internal consistency of the scales justified their use in the main investigation.

The first page of the questionnaire, contained demographic information and address questions relevant for this investigation.

The answers to the final questionnaire were collected via paper/pencil and online simultaneously, in order to obtain a larger and more diversified sample.

Sample

Sample size calculation

Tinsley & Tinsley *in* Moreira, 2009 recommended a 5 to 10 respondents for each item, until the limit of 300 respondents (Moreira, 2009).

In order to be able to conduct the factorial analysis it is recommended to have at least 10 participants per item. As the Subjective Fluctuating Happiness Scale has 10 items, Subjective Authentic-Durable Happiness Scale has 16 items, PANAS has 25 items and SWLS 5 items, the minimum sample size calculated was 560 respondents.

Target population

The target population consisted of Portuguese people either living in Portugal, Madeira and Azores or Portuguese emigrants. Both genders were included and all were over 18 years of age.

Survey the questionnaires

The final questionnaires were applied, simultaneously with paper/ pencil version and online version, in order to obtain a larger and more diversified sample.

The first page of the questionnaire, contained demographic and some others questions considered relevant for the study. The following pages contained the scales mentioned above: Portuguese versions of the Subjective Happiness Scales (SFHS and SA-DHS), and two measures of Well-Being: Positive and Negative Affect Scale (PANAS) and Satisfaction With Life Scale (SWLS).

Online Sample

Several mails were sent, asking people to fill in the online questionnaire and also to send it to others.

The online version used the SurveyMonkey with the link https://pt.surveymonkey.com/s/FelicidadesRM to collect data during three months.

The filling of the online questionnaire was simple and only required approximately 15 minutes.

Confidentiality of the respondents was assured. To maintain the ethical purpose of the researcher, no more than one answer could be sent from one computer.

Paper/Pencil Sample

Questionnaires were provided to individuals around the country, asking them to fill in the questionnaire (Appendix 1).

Verbal informed consent was obtained from all respondents, and indicated that their answers would be confidential.

All ethical concerns of the Helsinki declaration were followed.

Measures

To validate the Subjective Happiness Scales, four measures were used. Simultaneously with the Portuguese versions of Subjective Fluctuating Happiness Scale (SFHS) and Subjective Authentic-Durable Happiness Scale (SA-DHS) (Dambrun, Ricard *et al.*, 2012), two others measure of well-being

were applied: Portuguese validated versions of Positive and Negative Affect Scale - PANAS (Galinha & Ribeiro, 2005b) and Satisfaction With Life Scale - SWLS (Simões, 1992). See Appendix 1.

The subjective fluctuating happiness scale (SFHS) and the subjective authentic-durable happiness scale (SA-DHS) were developed by Michaël Dambrun *et al.* - University Blaise Pascal, France, and Matthieu Ricard - Mind and Life Institute, USA, with the main purpose of develop new scales skillful to measure distinct dimensions of happiness (Dambrun, Ricard *et al.*, 2012). The main advantages of these scales are to understand variability on happiness and provide the researcher with a scale capable to distinguish between fluctuating and authentic-durable happiness. According to those authors (Dambrun, Ricard *et al.*, 2012) SFHS and SA-DHS presented a logical factor structure, high internal consistency, an adequate convergent construct validity and stability over time.

Subjective Fluctuating Happiness Scale (SFHS)

As happiness has a considerable variation across the week, the hours of the day (Csikszentmihaly & Hunter, 2003; Dambrun, Ricard *et al.*, 2012), and the activities performed, some important fluctuation on happiness can occur (Dambrun, Ricard *et al.*, 2012). Subjective Fluctuating Happiness Scale (SFHS) was developed as a scale to measure perceived fluctuating degrees of happiness (Dambrun, Ricard *et al.*, 2012).

SFHS is a 10 items measure (Dambrun, Ricard *et al.*, 2012), introduced by one sentence where the respondent is asked to carefully read

each item and indicate in a 1-7 scale how much he/she agrees or disagrees with the sentence, with 1 meaning strongly disagree and 7, strongly agree. For fluctuating happiness, scores range from 1.0 to 7.0. Higher scores are related to higher fluctuating happiness (Dambrun, Ricard *et al.*, 2012).

Subjective Authentic-Durable Happiness Scale (SA-DHS)

Subjective Authentic-Durable Happiness Scale (SA-DHS), was developed with the main purpose to give rise a valid instrument to access subjective authentic-durable happiness (Dambrun, Ricard *et al.*, 2012).

Subjective Authentic-Durable Happiness Scale (SA-DHS) consists of 16 items (Dambrun, Ricard *et al.*, 2012). Items 8, 13 and 16 are negatively valenced items; they are fillers, included in the measure to control for compliance bias. These unhappiness items do not incorporate the score for happiness; they assess durable unhappiness (Dambrun, Ricard *et al.*, 2012).

To introduce SA-DHS, a sentence asks respondents to indicate, in a 1-7 scale, which is their regular level for each 16 items. The scale range from 1=very low to 7=very high. The mean score for authentic-durable happiness is the average of the 13 positive items. Two sub-scores can be calculated: Contentment and Inner Peace. According to the authors of the original scale items 1, 2, 3, 4, 6, 9, 11 and 12 loads on contentment sub-scale; and items 5, 7, 10, 14 and 15 loads on Inner Peace subscale. The score of SA-DHS range from 1.0 to 7.0; higher scores reflect greater authentic-durable happiness.

Positive Affect and Negative Affect Scale - PANAS

Positive Affect and Negative Affect Scale (PANAS) is a self-administered measure of positive affect (PA) and negative affect (NA), developed by Watson, Clark and Tellegen in 1988 (Watson, Clark *et al.*, 1988), with the main purpose of creating some brief scales to measure Positive and Negative Affect, considered by the authors as the two primary dimensions of mood (Watson, Clark *et al.*, 1988).

PANAS is a brief and easy questionnaire to administer, with 10-items mood scales for positive affects and 10-items scales for negative affects (Watson, Clark *et al.*, 1988). Both this 10-items scales are highly internally consistent, and show an appropriate stability over a 2 months time period (Watson, Clark *et al.*, 1988). According to the authors, PANAS are a reliable, valid and efficient means for measuring Positive and Negative Affects (Watson, Clark *et al.*, 1988).

This scale has been adapted and validated for Portuguese population by Galinha and Pais-Ribeiro in a version applied on this study (Galinha & Ribeiro, 2005a, 2005b).

The 10 descriptors for Positive Affect, in PANAS are: attentive, interested, alert, excited, enthusiastic, inspired, proud, determined, strong and active (Watson, Clark *et al.*, 1988). In the Portuguese version used in this study, the 10 descriptors for positive affects were: *interessado, entusiasmado, excitado, inspirado, determinado, orgulhoso, activo, encantado, caloroso e agradavelmente surpreendido* (Galinha & Ribeiro, 2005b).

The PANAS 10-items for Negative Affect are: distressed, upset, hostile, irritable, scared, afraid, ashamed, guilty, nervous and jittery (Watson, Clark *et*

al., 1988). In the Portuguese version used in this research the 10-items for Negative Affect were: *perturbado, atormentado, amedrontado, assustado, nervosa, trémulo, remorsos, culpado, irritado e repulsa* (Galinha & Ribeiro, 2005b).

Introducing the scale respondents were asked to choose and mark in the correspondent space, the answer that best described their feelings and emotions, utilizing a 5 Likert scale. In this scale, number one corresponds to "very slightly or not at all" intensity; number 2, to "a little"; 3 to "moderately"; 4 to "quite a bit" and 5 to " extremely", according to the original authors (Watson, Clark *et al.*, 1988). In the Portuguese version, number 1 corresponds to *"Nada ou muito ligeiramente"*; number 2 to *"um pouco"*; 3 to *"Moderadamente"*; 4 to *" bastante"* and number 5 to *"extremamente"* (Galinha & Ribeiro, 2005b).

Satisfaction With Life Scale – SWLS

The Satisfaction With Life Scale (SWLS) is a 5 items scale, developed by Ed Diener *et al.* (1985) to measure global life satisfaction (Beuningen, 2012), in a cognitive-judgmental process, centered on the person's own judgments instead of some other judgment considered important by researchers (Arrindell, Heesink *et al.*, 1999).

On the SWLS each item is a sentence. Introducing the scale, respondents were asked to mark in a Likert scale how much they agree or disagree. Number 1 corresponds to "*discordo muito"*; number 2 corresponds

to *"discordo um pouco"*; 3 to *"não concordo nem discordo"*; 4 to *"concordo um pouco"* and number 5 corresponds to *"concordo muito"* (Simões, 1992).

As, acording to the authors, each item is scored from 1 to 7, the possible range for SWLS is from 5 - low satisfaction, to 35 – high satisfaction (Diener, Emmons *et al.*, 1985).

Collection of data

Data were collected throughout the country, with the purpose to survey Portuguese people regardless where they lived – which include Portuguese main land, Islands and Portuguese emigrants. Collection of data occurred, simultaneously for the online survey method and the paper pencil method, during the months of August, September and October 2013.

For the online version, SurveyMonkey was used to collect data. Several mails were sent to different individuals, asking them to fill in the on-line questionnaire and also send it to other people.

For the paper/pencil version people were directly asked to fulfill the questionnaires.

Description of variables

Dependent variables

Table 2. Study I, Dependent Variables

Dependent Variables	
Subjective fluctuating happiness	SFHS
Subjective authentic-durable happiness	SA-DHS
Positive and Negative Affect	PANAS
Satisfaction with life	SWLS

SFHS= Subjective Fluctuating Happiness Scale

SA-DHS= Subjective Authentic-Durable Happiness Scale

PANAS= Positive and Negative Affect Scale

SWLS= Satisfaction With Life Scale

Independent variables.

Table 3. Study1, Independent Variables (A)

Independent Variables (A)	
Socio-demographics	Age; marital status; gender; have children; occupation; housing region; level of education; socio-economic level; academic degree
Religiosity	To follow a religion or a spiritual thought: religious involvement
Practice of sports	Practice sport; the frequency of sport activity; practice yoga or meditation; the frequency of practice yoga or meditation

Table 4. Independent Variables (B)

Independent Variables (B)	
Individuals factors to improve happiness	Economic stability; family stability; Inner peace; professional success
Individuals factors to disturb happiness	Economic instability; family instability; emotional instability; professional instability

Data Processing

To explore the factor structure of the two Portuguese scales an exploratory principal components factor analysis with varimax rotation was done before running statistical analysis.

Reliability analyses, specifically Cronbach's alpha, were computed for each measure.

Means, standard deviations, and bivariate correlations were computed and reported for all scales. Categorical variables (e.g., gender) were dummy coded for subsequent analyses.

All data were analyzed with Statistical Package for the Social Sciences SPSS, version 21.

All mentioned analysis was conducted separately for the Online sample, for the paper/pencil sample and lastly for the total sample.

RESULTS

Results will be presented separately for:

I. Online sample

II. Paper/pencil sample

III. Total sample

I. Results, Online sample

I. A. Factor analysis (Online sample)

To assess whether Subjective Fluctuating Happiness and Authentic-Durable Happiness are two distinct constructs, all the items were submitted to an exploratory factor analysis with varimax rotation.

The factor analysis resulted in three factors.

The first factor explained 27.25% of the variance and was comprised of the contentment items from the SA-DHS scale, the second 24.10% was comprised of the SFHS items and the third factor of 13.25% were the Inner peace items from SA-DHS.

These findings suggest that the measures were assessing distinct constructs.

Table 5. Factors Loading SFHS and SA-DHS – Online

Items	F1) SA-DHS Contentment	F2) SFHS	F3) SA-DHS Inner Peace
SA-DHS 4	.84		
SA-DHS 2	.79		
SA-DHS 3	.79		
SA-DHS 15	.78		
SA-DHS 9	.77		
SA-DHS 11	.71		

SA-DHS 1	.70		
SA-DHS 6	.68		.43
SA-DHS 12	.68		.34
SFHS 8		.82	
SFHS 9		.82	
SFHS 5		.81	
SFHS 7		.77	
SFHS 4		.75	
SFHS 10		.70	
SFHS 2		.67	
SFHS 3		.63	-.34
SFHS 6		.63	
SFHS 1		.41	
SADHS 7	.43		.74
SADHS 10	.47		.74
SADHS 14	.45		.72
SADHS 5	.51		.68

Notes:

Loadings below .30 were omitted

F1=contentment items of SA-DHS, corresponds to 27.25% of variance;

F2=items of SFHS, corresponds to 24.10% of variance;

F3= Inner peace items of SA-DHS, corresponds to 13.25% of variance;

Items 8, 13 and 16 from SA-DHS corresponds to Unhappiness

Factor Structure of the Subjective Fluctuating Happiness Scale (SFHS)

A principal components factor analysis conducted with varimax rotation restricted the solution to one factor for Subjective Fluctuating Happiness Scale. The factor explained 54.96% of the variance and nine of the items had factor loadings greater than .60. The only exception was item 1 ("I have had satisfactions and also great disappointments"); this item only had a .39 loading.

Table 6. Factor Loading SFHS, Online

Items	Loading
Ao longo da minha vida…	
SFHS 8 *"Passo muitas vezes de um alto nível de prazer para um baixo nível de prazer"*	.86
SFHS 5 *"Mudo muitas vezes de euforia para tristeza"*	.84
SFHS 7 "*O meu nível de felicidade é bastante instável, algumas vezes alto, outras baixo"*	.84
SFHS 9 *"Tenho períodos em que mudo, de um momento para o outro, de extrema felicidade para momentos muito menos satisfatórios"*	.84
SFHS 4 *"Tenho tido períodos de euforia mas são quase sempre seguidos por períodos muito menos excitantes"*	.77
SFHS 10 "*No mesmo dia estou feliz e outras vezes triste"*	.72
SFHS 3 *"O meu nível de serenidade é muito variável"*	.72
SFHS 2 *"Os períodos de prazer que tenho tido são sempre seguidos de período de descontentamento"*	.70

SFHS 6 *"Períodos de mal-estar seguem períodos de bem-estar"*	.61
SFHS 1 *"Tenho tido satisfações e também grandes desilusões"*	.39

Factor Structure of the Subjective Authentic Durable Happiness Scale (SA-DHS)

The Subjective Authentic-Durable Happiness Scale consists of 16 items. There are three negatively valenced items, the unhappiness items (item 8="*Descontentamento*", item 13="*sentir-se mal*" and item 16="*Infelicidade*"), not included in the analyses. Unhappiness items are fillers; they were not used. They were only included in the measure to control for compliance bias.

An exploratory principal components factor analysis with varimax rotation was conducted. The factor analysis resulted in two factors. The first factor explained 38.46% of the variance, and the second factor explained 32.66% of the variance.

The Table 7 shows the factor loadings and the subscales that the items loads on. Values below .30 were omitted. As can be seen in the table several items load on both factors. Item 15 loaded on the contentment subscale. And item 6 loaded equally (.60) on both subscales.

Table 7. Factor Loading of SA-DHS, Online

Scale Items	F1 Contentment	F2 Inner Peace
Na sua vida, qual é o seu nível regular de…		
SA-DHS 4 *"Êxtase (felicidade que parece completa"*	.84	
SA-DHS 9 *"Beatitude (felicidade perfeita)"*	.79	
SA-DHS 15 "*Plenitude (sensação de satisfação absoluta, felicidade realização total)"*	.77	.32
SA-DHS 3 *"Prazer"*	.74	.38
SA-DHS 2 *"Felicidade"*	.73	.44
SA-DHS 11 *"Realização total"*	.69	.32
SA-DHS 1 *"Bem-estar geral"*	.63	.46
SA-DHS 12 *"Alegria"*	.60	.51
SA-DHS 10 *"Paz interior"*	.32	.85
SA-DHS 7 *"Serenidade"*		.83
SA-DHS 14 *"Tranquilidade (calma interior)"*	.31	.82
SA-DHS 5 *"Paz de espírito"*	.37	.82
SA-DHS 6 *"Satisfação"*	.60	.60

F1= Contentment subscale

F2= Inner Peace subscale

Item 6 loads equally on both subscales

Item 15: loads on contentment subscale

I.B. Descriptive statistic, Online

Results will be presented in two parts:

1. Demographic factors

2. Auto-evaluation for individual factors that improve or disturb happiness

I. B. 1. Demographic Factors

Age

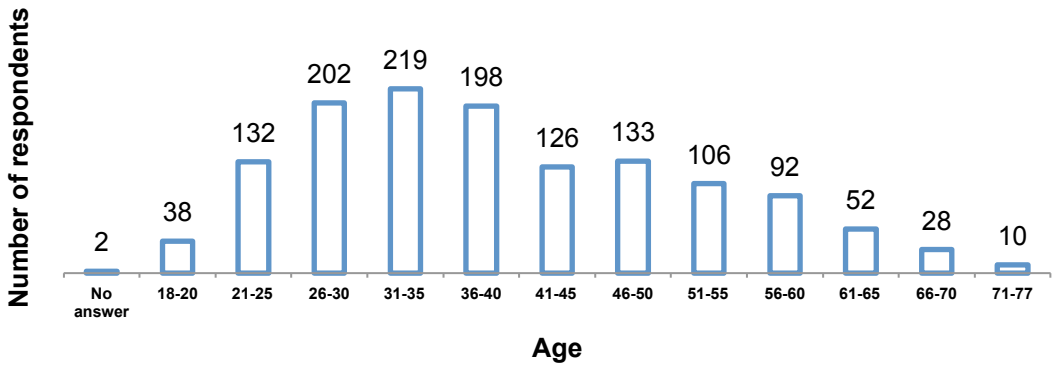


Figure 1. Age, Online

The online sample had a total of 1.338 respondents. The minimum age was 18 years old and the maximum was 77 years old. The average was 40 years old (mean=39.54).

Marital Status

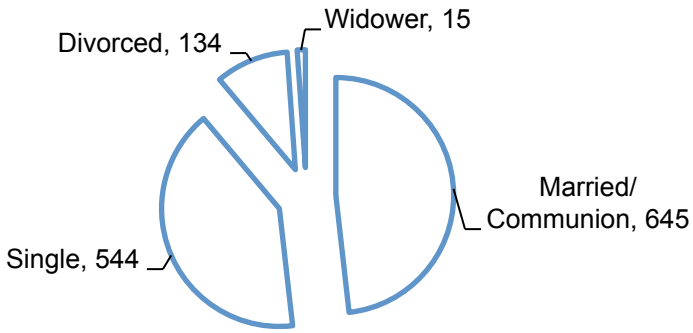


Figure 2. Marital Status, Online

48.2% of the respondents were married or lived in communion; 40.7% single; 10.0% divorced and 1.1% widower.

Gender

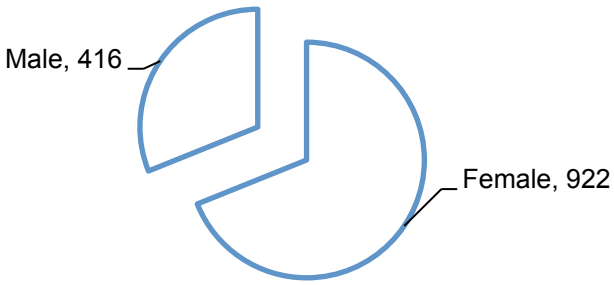


Figure 3. Gender, Online

68.9% were female and 31.1% were male.

Had children

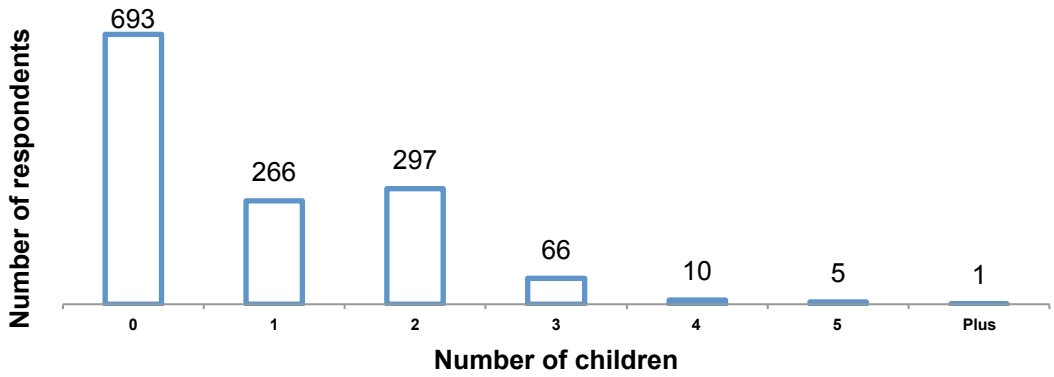


Figure 4. Had Children, Online

51.8% of respondents had no children; 22.2% had 2; 19.9% had 1; 4.9% had 3; 0.7% had 4; 0.4% had 5 and 0.1% had 8 children.

Occupation

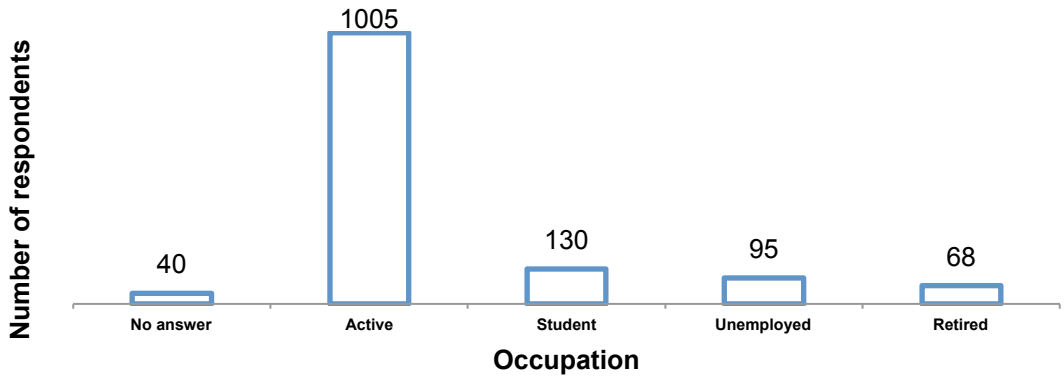


Figure 5. Occupation, Online

77.4% of the respondents were active; 10.0% students; 7.3% unemployed and 5.2% were retired.

Housing region

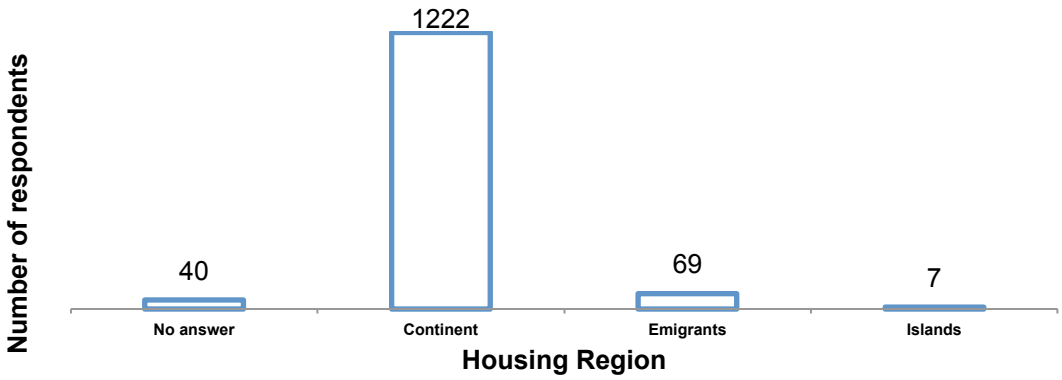


Figure 6. Housing region, Online

94.1% of the respondents were living in the continent; 5.3% were emigrants; and 0. 5% lived on the Islands.

Level of education

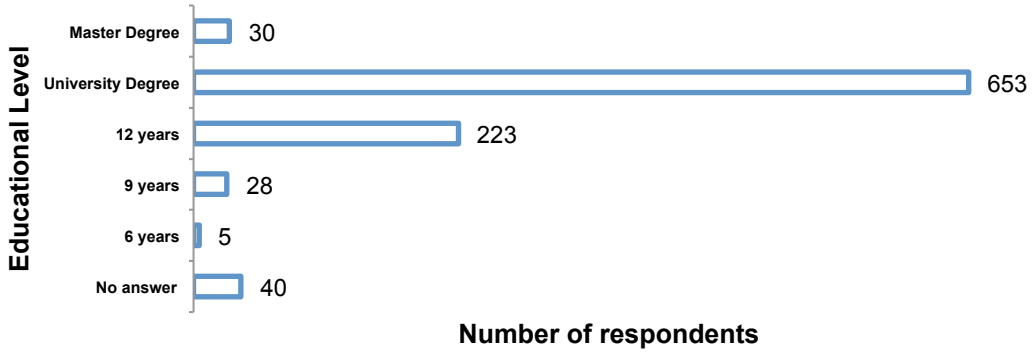


Figure 7. Level of education, Online

50.3% of respondents had a university degree; 30.0% had a master degree; 17.2% had 12 years of schooling; 2.2% had 9 years and 0.4% had 6 years of schooling.

Socio-economic level

Figure 8. Socio-economic level, Online

77.3% of respondents considered themselves as having a medium social economical level; 13.0% high; 8.8% low; 0.5% a very low and 0.4% considered themselves as having a very high social economical level.

Religious involvement

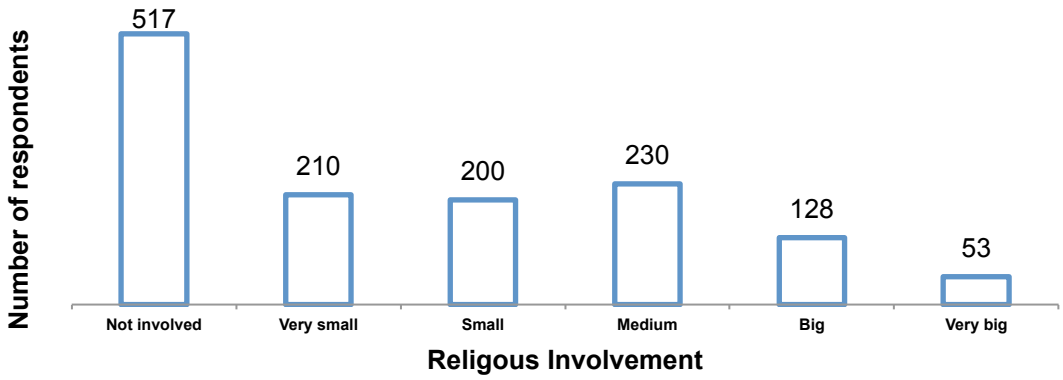


Figure 9. Religious involvement, Online

53.5% of the respondents did not profess a religion and 46.5% of them professed a religion.

From those who responded to profess a religion, 28.0% considered themselves as having a medium religious involvement; 25.6% a very small; 24.4% small; 15.6% big; and 6.5% considered themselves as having a very big religious involvement.

Practice sports

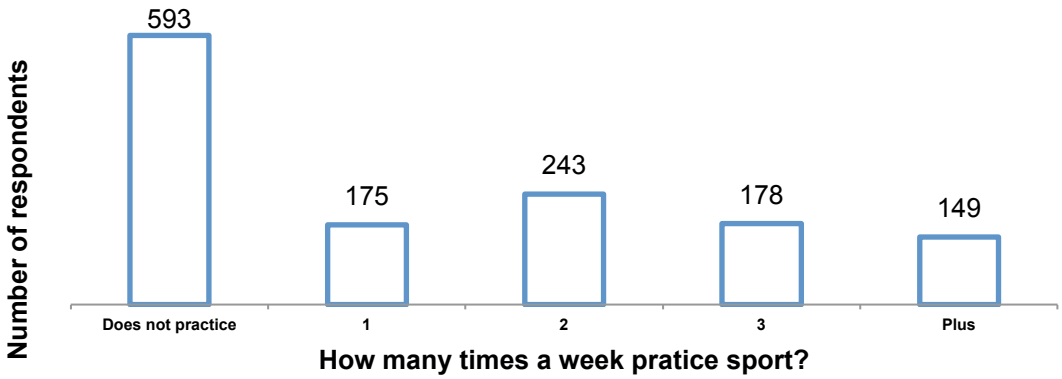


Figure 10. Practice sports, Online

56.0% of the respondents did not practice any sport and 44.0% practiced.

From those who indicated to practice a sport, 32.6% did it twice a week; 23.9% 3 times a week; 23.5% once a week and 20.0% practiced sport more than 3 times a week

I. B. 2. Auto-evaluation for individuals factors that improve or disturb happiness

Individual factors that improve happiness

Table 8. Individual Factors that Improve Happiness, Online

	Economic Stability	Family Stability	Inner Peace	Professional Success	Other
First	8.1	38.8	43.4	2.8	6.9
Second	26.7	40.4	19.5	9.8	3.6
Third	36.9	12.7	19.8	27.9	2.7
Fourth	24.7	5.9	13.5	52.0	3.9
Fifth	3.6	2.3	3.7	7.5	82.8

Note: Values are presented in percentage

Economic stability, as a positive contributing to happiness, comes in third place for 36.9% of the respondents; in second for 26.7%; in fourth for 24.7%; in first for 8.1%; and in fifth for 3.6% of the respondents.

Family Stability was a positive factor to happiness, in second place for 40.4% of the respondents; in first for 38.8%; in third, for 12.7% of the respondents; in fourth, for 5.9%; and in fifth for 2.3% of the respondents.

Inner peace was a positive contribute to happiness, in first place for 43.4% of the respondents; in third for 19.8%; in second for 19.5%; in fourth for 13.5%; and in fifth for 3.7% of the respondents.

Professional success as a positive contribute to happiness, comes in fourth place for 52.0% of the respondents; in third for 27.9%; in second for 9.8%; in fifth for 7.5%; and in first for 2.8% of the respondents.

The importance of some other non mentioned factor, considered as a positive contribute to happiness, comes in fifth place for 82.8% of the respondents; in first 6.9%; in fourth for 3.9%; in second for 3.6%; and in third for 2.7% of the respondents.

Individual factors that disturb happiness

Table 9. Individual Factors that Disturb Happiness, Online sample

	Economic instability	Family instability	Emotional Instability	Professional Instability	Other
First	13.3	37.6	39.9	3.5	5.8
Second	26.5	38.5	23.4	9.7	1.9
Third	35.2	14.2	20.1	27.9	2.6
Fourth	22.5	7.3	14.6	53.9	1.8
Fifth	2.5	2.5	2.0	5.1	87.9

Note: Values are presented in percentage

The individual factors that disturb happiness are presented on Table 9.

I. C. Psychometric characteristics, Online sample

Internal Consistency

For Subjective Fluctuating Happiness Scale (SFHS) the value for Cronbach's alpha was .90. The Table 10 presents Cronbach's alpha for the SA-DHS measure, treated as one-dimensional or having two sub dimensions.

Table 10. Internal Consistency of SA-DHS, Online

	Number of items	Cronbach's alpha (α)
All items	13	.95
Contentment, without item 15	8	.92
Contentment, with item 15	9	.93
Inner peace, with item 15	5	.91
Inner peace, without item 15	4	.92

Contentment subscale: 1, 2, 3, 4, 6, 9, 11and 12

Inner peace subscale: 5, 7, 10 and 14

In this study item 15 was treated as a Contentment item

Mean and Standard deviation

Table 11. Mean and Standart Deviation, Online

		Mean	Std. Deviation
Subjective Fluctuating Happiness		3.50	1.22
SA-DHS	Contentment	4.46	1.00
	Inner Peace	4.80	1.14
Negative Affect		18.49	6.49
Positive Affect		33..09	5.78
Satisfaction with Life		17.28	4.79

Mean value, in a 1 to 7 scale, was 3.50 for Subjective Fluctuating Happiness.

Subjective authentic-durable happiness scores 4.45 for Contentment subscale and 4.79 for Inner Peace subscale.

Convergent Validity

Convergent validity was assessed by correlating the two measures with positive affectivity, negative affectivity and the satisfaction with life.

Based on the factor analyses and reliability analyses, item 15 was treated as part of the Contentment sub-scale.

The bivariate correlations are presented on Table 12.

Table 12. Convergent validity, Online

Variable		1	2	3	4	5
1. SFHS						
SA-DHS	2. Contentment	-.47				
	3. Inner Peace	-.50**	.74**			
4. Negative Affect		.51**	-.37**	-.44**		
5. Positive Affect		-.22**	.56**	.42**	-.05	
6. SWLS		-.43**	.73**	.55**	-.37**	.44**

* p < .05 and ** p < .01

Subjective Fluctuating Happiness was positively related to Negative Affect (r = .51**; p< .01) and negatively related with all others: Inner Peace (r = -.50**; p< .01) ; Contentment (r= -.47), Positive Affect (r= -.22**; p<.01); and Satisfaction with Life (r= -.43**; p<.01).

Contentment was negatively related with Subjective Fluctuating Happiness (r= -.47) and Negative Affect (r= -.37**; p< .01), and positively related with Positive Affect(r= .56**; p< .01), Inner Peace (r= .74**; p< .01) and Satisfaction With Life (r= .73**; p< .01).

Inner Peace was negatively related with Subjective Fluctuating Happiness (r= -.50**; p< .01) and Negative Affect (r= -.44**; p< .01), and positively related with Contentment (r= .74**; p< .01), with Positive Affect (r= .42**; p< .01) and Satisfaction With Life (r= .55**; p< .01).

Negative Affect were positively related to Subjective Fluctuating Happiness (r= .51**; p< .01) and negatively related with Contentment (r= -.37**, p< .01)), with Inner Peace (r= -.44**;p<.01), with Positive Affect (r= -.05) and with Satisfaction with Life (r= -.37**; p<.01).

Positive Affects were negatively related to Subjective Fluctuating Happiness (r= -22**; p< .01) and Negative Affect (r= -.05), and positively related with Contentment (r= .56**; p< .01), with Inner Peace (r= .42**; p<.01) and Satisfaction with Life (r= .44**; p<.01).

Satisfaction with life was negatively related to Subjective Fluctuating Happiness (r= -.43**; p< .01) and to Negative Affect (r= -. 37**; p<. 01); and was positively related to Contentment (r= .73**; p< .01), with Inner Peace (r= .55**; p< .01) and Positive Affect (r= .44**; p< .01).

Discriminant Validity

Discriminant validity was assessed by correlating the two new measures with age, gender, education level, socioeconomic level and endorsement of religion.

Table 13. Discriminant validity, Online

Variable		1	2	3	4	5	6	7
1. SFHS								
SADHS	2.Contentment	-.47**						
	3. Inner Peace	-.49**	.75**					
4. Age		-.08**	-.03	.05				
5. Gender		-.04	.02	.02	-.01			
6. Education Level		-.11**	.09**	.08**	-.02	-.04		
7. Socioeconomic Level		-.12**	.18**	.12**	.16**	.09**	.17**	
8. Religion		-.03	.05	.06*	.11**	-.11**	.04	.02

p < .05 and ** p < .01

Gender, 1 = female 2 = male

Endorsement of Religion= Religion 1 = yes, 2 = no

Subjective Fluctuating Happiness was negatively related to all variables: Subjective Authentic-Durable Happiness both on Contentment (r= -.47**, p < .01) and Inner Peace subscales (r= -.49**; p < .01); age (r= -.08**; p < .01), educational level (r= -.11**; p < .01) and socioeconomic level (r= -.12**; p < .01). Subjective Fluctuating Happiness, although negatively correlated with religion, it did not reach statistical significance (r= -.03).

Contentment was positively related to Inner Peace (r= .75**; p < .01), educational level (r= .09**; p < .01) and socioeconomic level (r= .18**; p <

.01). Contentment was positively related to religion, but with no statistical significance (r= .05).

Inner Peace is positively related with religion (r= .06*; p < .05), educational level (r= .08**; p < .01) and socioeconomic level (r= .12**; p < .01). It was also positively related to age but with no statistical significance (r= .05).

II. Results for Paper/Pencil sample

II. A. Factor analysis, Paper/Pencil sample

Factor Structure of Subjective Fluctuating Happiness Scale (SFHS)

SFHS consist of 10 items.

The Principal Component Factor Analysis (PCA) with varimax rotation resulted in one factor explaining 53.78% of the variance. Item 1 had the lowest loading. Table 14

Table 14. Factor Loading for SFHS, Paper/Pencil

Items	Factor Loading
Ao longo da minha vida …	
SFHS 8 "*Passo muitas vezes de um alto nível de prazer para um baixo nível de prazer"*	.87
SFHS 7 "*O meu nível de felicidade é bastante instável, algumas vezes alto, outras baixo"*	.85
SFHS 9 *"Tenho períodos em que mudo de um momento para o outro de extrema felicidade para momentos muito menos satisfatórios"*	.84
SFHS 5 *"Mudo muitas vezes de euforia para tristeza"*	.84
SFHS 4 *"Tenho tido períodos de euforia mas são quase sempre seguidos por períodos muito menos excitantes"*	.76
SFHS 10 *"No mesmo dia estou feliz e outras vezes triste"*	.72
SFHS 2 *"Os períodos de prazer que tenho tido são sempre seguidos de period de descontentamento*"	.70
SFHS 3 *"O meu nível de serenidade é muito variável"*	.66
SFHS 6 *"Períodos de mal-estar seguem períodos de bem-estar"*	.57
SFHS 1 *"Tenho tido satisfações e também grandes desilusões"*	.41

Factor Structure for Subjective Authentic-Durable Happiness Scale (SA-DHS)

The Subjective Authentic-Durable Happiness Scale consists of 16 items. However, there were three negatively valenced items, the unhappiness items (item 8= "*Descontentamento*", item 13= "*Sentir-se mal"* and item 16= "*Infelicidade*"), not included in the analyses. Unhappiness item are fillers; they were not used. They were only included in the measure to control for compliance bias.

PCA with varimax rotation resulted in 2 factors.

Table 15. Factor Loading for SA-DHS, Paper/Pencil

Scale Items	F1 Contentment	F2 Inner Peace
SA-DHS 2 "*Felicidade*"	.83	
SA-DHS 3 "*Prazer"*	.81	
SA-DHS 4 "*Êxtase (felicidade que parece completa)*"	.81	
SA-DHS 1 "*Bem-estar geral*"	.78	
SA-DHS 15 *"Plenitude (sensação de satisfação absoluta, felicidade, realização total)"*	.67	.39
SA-DHS 6 "*Satisfação*"	.66	.52
SA-DHS 9 "*Beatitude (felicidade perfeita)*"	.65	.32
SA-DHS 11 "*Realização total*"	.62	.42
SA-DHS 12 "*Alegria"*	.50	
SA-DHS 10 "*Paz interior"*		.73
SA-DHS 14 "*Tranquilidade (calma interior)*"	.39	.73

SA-DHS 7 "*Serenidade*"	.31	.71
SA-DHS 5 *"Paz de espírito"*	.53	.65

SA-DHS was treated as one dimensional, and then two separate dimensions: Contentment and Inner peace subscales.

Item 15 loaded on the Contentment factor.

II. B. Descriptive statistic, Paper/Pencil sample

Paper/Pencil sample had 1018 respondents

Results will be presented in two parts:

1. Demographic factors

2. Auto-evaluation for individual factors that improve or disturb happiness

II. B. 1 Demographic Factors

Age

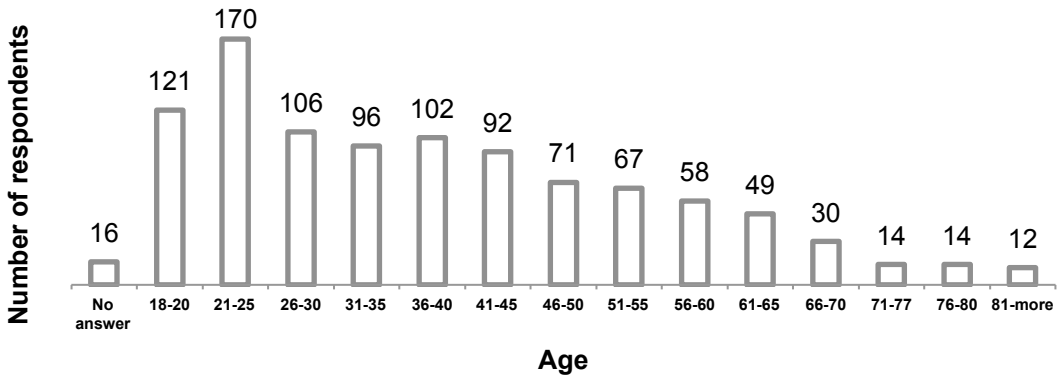


Figure 11. Age, Paper/Pencil

The minimum age was 18 years old and the maximum was 91 years old. The average was 39 years old (mean= 38.58).

Marital Status

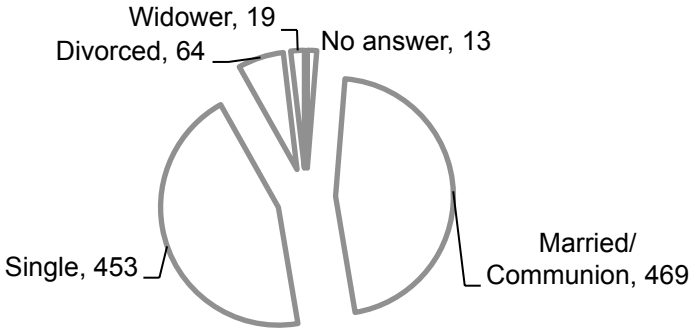


Figure 12. Marital status, Paper/Pencil

46.7% of the respondents were married or lived in communion, 45.1% single; 6.4% divorced and 1.9% were widowers.

Gender

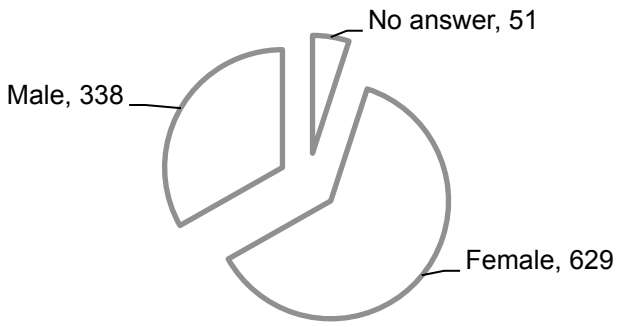


Figure 13. Gender, Paper/Pencil

65.0% of respondents were female and 35.0% were male.

Had children

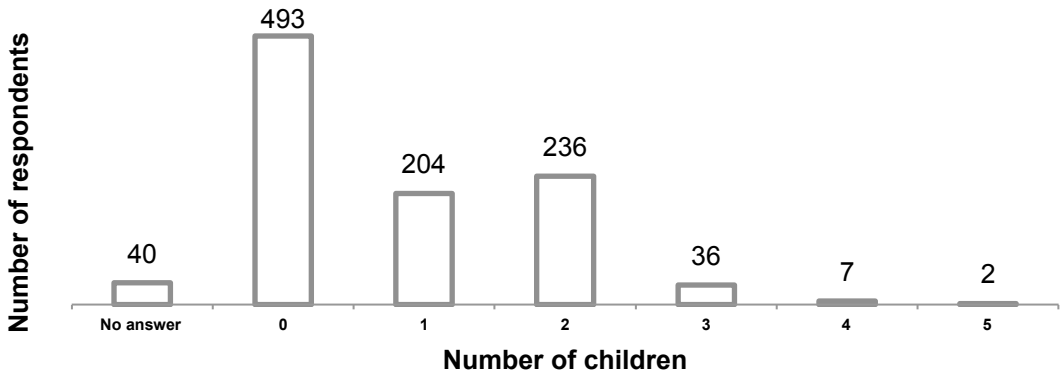


Figure 14. Had children, Paper/Pencil

50.4% had no children; 24.1% had 2; 20.9% had 1 child; 3.7% had 3; 0.7% had 4 and 0.2% had 5 children.

Occupation

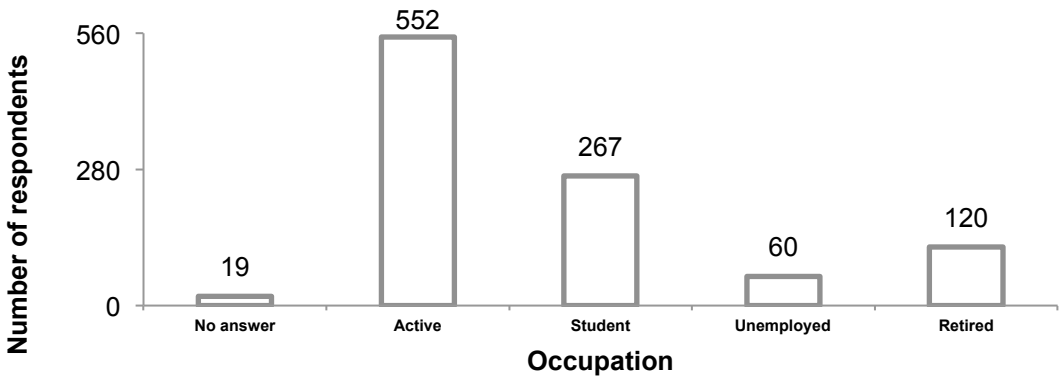


Figure 15. Occupation, Paper/Pencil

55.3% of the respondents were active; 26.7% students; 12.0% retired and 6.0% were unemployed.

Housing region

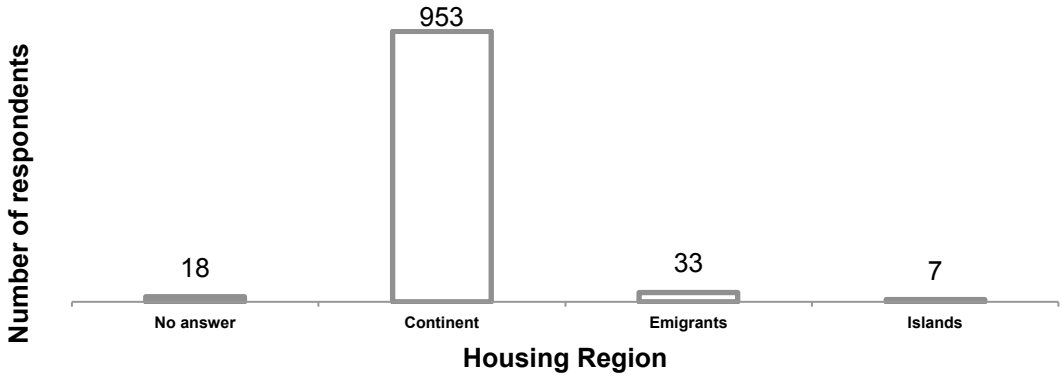


Figure 16. Housing region, Paper/Pencil

95.3% of the respondents were living in the main land; 3.3% were emigrants; and 1.4% lived on the islands.

Level of education

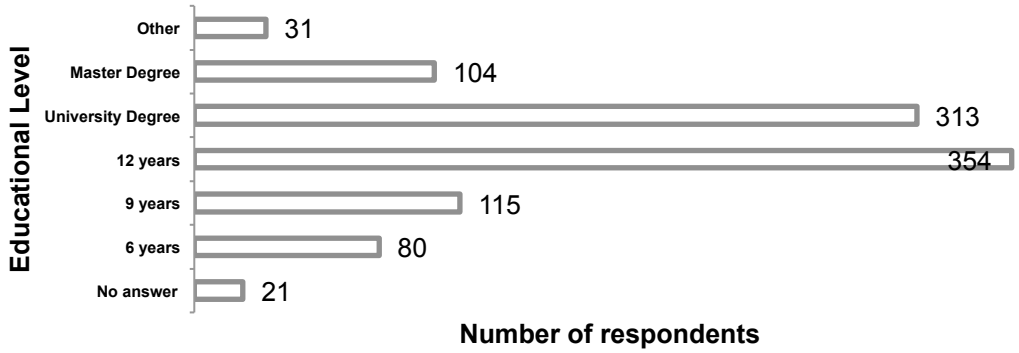


Figure 17. Level of education, Paper/Pencil

35% of respondents had 12 years of schooling; 31.4% had a university degree; 11.5% had 9 years of school; 10.4% had a master degree; 8.0% had 6 years of school and 3.1% had some other not mentioned degree.

Socio-economic level

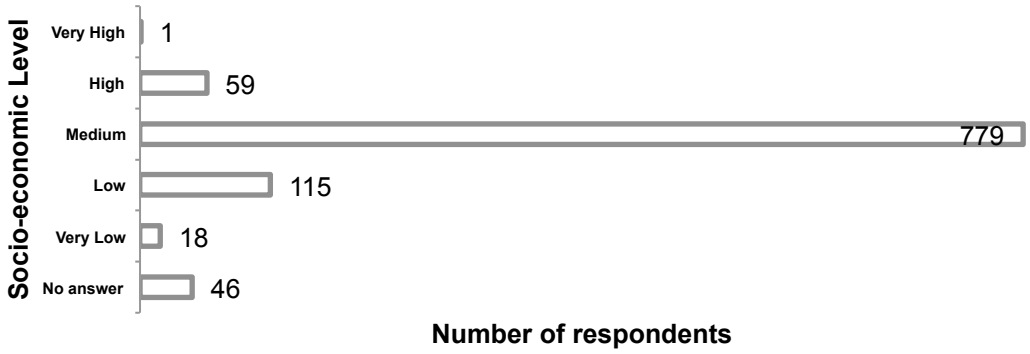


Figure 18. Socio-economic level, Paper/Pencil

80.1% of respondents considered themselves as having a medium social economical level; 11.8% low; 6.1% high; 1.9% a very low and 0.1% of respondents considered themselves as having a very high social economical level.

Religious involvement

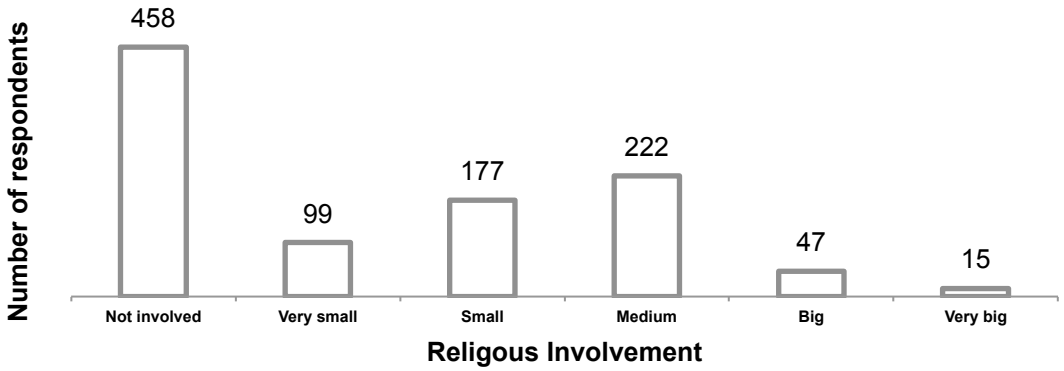


Figure 19. Religious involvement, Paper/Pencil

56.9% of the respondents professed a religion and 43.1% of them said that they did not profess a religion.

From those who responded to profess a religion, 39.6% considered themselves as having a medium religious involvement; 31.6% a small; 17.7% had a very small; 8.4% a big and 2.7% considered themselves as having a very big religious involvement.

Practice sports

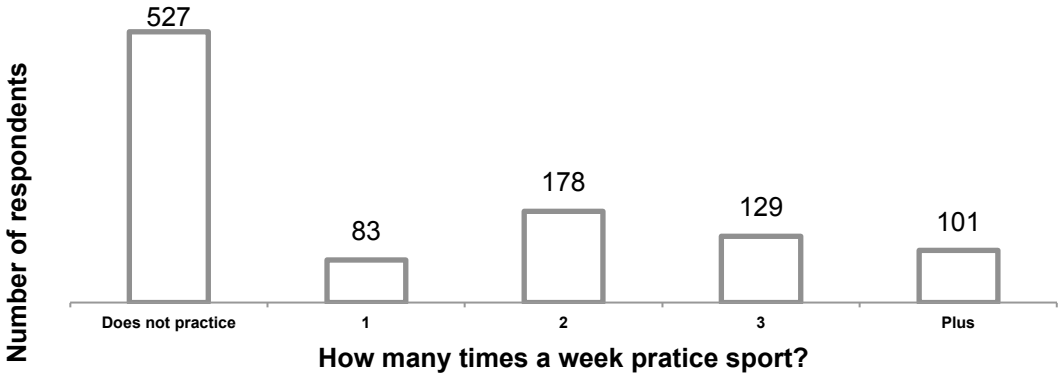


Figure 20. Practice sports, Paper/Pencil

50.5% of the respondents did not practice any sport and 49.5% practiced.

From those who indicated practice a sport 36.3% did it twice a week; 26.3% 3 times a week; 20.6% more than 3 times and 16.9% practiced once a week.

Part 2. Auto-evaluation for individuals factors that improve or disturb happiness

Individual factors that improve happiness

Table 16. Factors that Improve Happiness, Paper/Pencil

	Economic Stability	Family Stability	Inner Peace	Professional Success	Other
First	7.3	58.3	31.4	2.2	47.1
Second	23.3	32.1	30.5	14.2	5.9
Third	35.8	6.7	19.1	39.2	11.8
Fourth	33.1	2.8	18.9	43.9	11.8
Fifth	0.6	0.1	0.1	0.6	23.5

Note: Values are presented in percentage.

Economic Stability as a positive contributing factor to happiness, comes in third place for 35.8% of the respondents; in fourth for 33.1%; in second for 23.3%; in first for 7.3% and in fifth for 0.6% of the respondents.

Family Stability, as a positive factor to happiness, comes in first for 58.3% of the respondents; in second for 32.1%; in third for 6.7%; in fourth for 2.8% and in fifth for 0.1% of the respondents.

Inner Peace, as a positive factor to happiness, comes in first for 31.4% of the respondents; in second for 30.5%; in third for 19.1%; in fourth for 18.9% and in fifth for 0.1% of the respondents.

Professional Success as a positive factor to happiness comes in fourth for 43.9% of the respondents; in third for 39.2%; in second for 14.2%; in first for 2.2% and in fifth for 0.6% of the respondents.

47.1% of respondents considered had in first place some other, non mentioned, positive factor for happiness; 23.5% in fifth; 11.8% in fourth; 11.8% in third and 5.9% of the respondents considered had in second place, another positive factor that improved happiness besides the factors given in the questionnaire.

Individual factors that disturb happiness

Table 17. Factors that Disturb Happiness, Paper/Pencil

	Economic instability	Family instability	Emotional instability	Professional instability	Other
First	9.9	54.9	30.2	4.3	53.8
Second	21.1	31.5	31.7	16.0	7.7
Third	37.4	8.3	19.9	34.8	15.4
Fourth	31.3	5.2	18.1	44.4	7.7
Fifth	0.4		0.1	0.4	15.4

Note: Values are presented in percentage

Economic Instability, as a disturbing factor for happiness, comes in third place for 37.4% of the respondents; in fourth place for 31.3%; in second for 21.1%; in first for 9.9% and in fifth for 0.4% of the respondents.

Family Instability, as a disturbing factor for happiness, comes in first for 54.9% of the respondents; 31.5% in second; 8.3% in third; 5.2% in fourth and 0.1% in fifth.

Emotional Instability, comes in second place as a disturbing factor for happiness for 31.7% of the respondents; in first for 30.2%; in third for 19.9%; in fourth for 18.1%; and in fifth place for 0.1% of the respondents.

44.4% of the respondents said that professional instability comes in fourth place as a disturbing factor of their happiness; 34.8% in third; 16.0% in second; 4.3% in first and 0.4% of the respondents said that professional instability comes in fifth place as a disturbing factor of their happiness.

53.8% of the respondents considered to have in first place an “Other” disturbing factor for their happiness, besides the factors that were given to them to choose; 15.4% in third place; 15.4% in fifth; 7.7% in second; and 7.7% of the respondents considered in fourth place an “Other” disturbing factor for their happiness.

II. C. Psychometric characteristics,
Paper/Pencil sample

Internal Consistency

Cronbach’s alpha for SFHS was .90.

The Table 18 presents the Cronbach’s alpha for the SA-DHS measure, treated as one-dimensional and with two sub dimensions.

Table 18. Internal Consistency of SA-DHS, Paper/Pencil

	Number of items	Cronbach's alpha (α)
SA-DHS all items	13	.90
Contentment without item 15	8	.87
Contentment with item 1	9	.89
Inner Peace with item 15	5	.76
Inner Peace without item 15	4	.72

Contentment subscale: 1, 2, 3, 4, 6, 9, 11and 12

Inner Peace subscale: 5, 7, 10 and 14

In this study item 15 was treated as a Contentment item.

Mean and Standard deviation

Table 19. Descriptive Statistic, Paper/Pencil

		Mean	Std. Deviation	N
SFHS		3.67	1.18	982
SA-DHS	Contentment	4.58	1.05	982
	Inner Peace	4.82	1.18	982
Negative Affect		18.63	6.60	982
Positive Affect		32.76	6.19	982
Satisfaction With Life		17.78	4.57	982

Convergent Validity

Convergent validity was assessed by correlating the two measures with positive affectivity, negative affectivity and the satisfaction with life scale. The bivariate correlations are presented on Table 20.

Table 20. Pearson's Correlation, Paper/Pencil

		1	2	3	4	5
SFHS						
SA-DHS	Contentment	-.29**				
	Inner Peace	-.31**	.67**			
Negative Affect		.36**	-.30**	-.33**		
Positive Affect		-.12**	.50**	.37**	.01	
SWLS		-.30**	.63**	.44**	-.20**	.38**

* $p < .05$ and ** $p < .01$

Subjective Fluctuant Happiness Scale was positively related with Negative Affect ($r = .36^{**}$; $p < .01$) and negatively related with all the others:

Contentment(r= -.29**; p < .01), Inner Peace (r= -.31**; p < .01), Positive Affect (r= -.12**; p < .01) and Satisfaction with Life (r= -.30**; p < .01).

Contentment was negatively related with Negative Affect(r= -.30**; p < .01), and positively related with Inner Peace (r= .67**; p < .01), Positive Affect (r= .50**; p < .01) and Satisfaction with Life (r= .63**; p < .01)

Inner peace was negatively related with Negative Affect (r= -.33**; p < .01), and positively related with Positive Affect (r= .37**; p < .01) and Satisfaction with Life (r= .44**; p < .01)

Negative Affect were negatively related with Satisfaction with Life (r= -.20**; p < .01), Contentment (r= -.30**; p < .01) and Inner Peace (r= -.33**; p < .01); and positively related with subjective fluctuating happiness (r= .36**; p < .01).

Positive Affects were positively related with Satisfaction with Life (r= .38**; p < .01), Contentment (r= .50**; p < .01) and Inner Peace (r= .37**; p < .01); and was negatively related with Subjective Fluctuating Happiness (r= -.12**; p < .01).

Discriminant Validity

Discriminant validity was assessed by correlating SFHS and SA-DHS with age, gender, education level, socioeconomic level and endorsement of religion.

Table 21. Pearson's Correlation, Paper/Pencil

		1	2	3	4	5	6	7
1. SFHS								
SA-DHS	2. Contentment	-.29**						
	3. Inner Peace	-.30**	.65**					
4. Age		-.01	-.18**	-.04				
5. Gender		-.17**	.06	.06	.07*			
6. Educational level_recoded		-.13**	.15**	.11**	-.17**	-.07*		
7. Socioeconomic Level		-.05	.15**	.08*	-.05	-.01	.25**	
8. Religion		-.07	.05	-.01	-.14**	.12**	.04	-.03

* p < .05 and ** p < .01

Subjective Fluctuating Happiness was negatively related to all items: with Subjective Authentic-Durable Happiness both on Contentment (r= -.29**; p < .01) and Inner Peace (r= -.30**; p < .01); gender (r= -.17**; p < .01), educational level (r= -.13**; p < .01), socioeconomic level (r= -.05); religion (r= -.07) and age (r= -.01).

Subjective Authentic-Durable Happiness, Contentment subscale was negatively related with age (r= -.18**; p < .01) and with Subjective Fluctuating Happiness (r= -.29**; p < .01). It was positively related with Subjective Authentic-Durable Happiness, Inner Peace subscale (r= .65**; p < .01), educational level (r= .15**; p < .01), and socioeconomic level (r= .15**; p < .01).

Subjective Authentic-Durable Happiness, Inner Peace subscale was negatively related with Subjective Fluctuating Happiness (r= -.30**; p < .01). Subjective Authentic-Durable Happiness, Inner Peace subscale was positively related to educational level(r= .11**; p < .01), socioeconomic level (r= .08*; p < .05) and Contentment (r= .65**; p < .01).

III. Results for total sample

All together, the total number of participants was 2356.

III. A. Factor analysis, total sample

Factor Structure of Subjective Fluctuating Happiness Scale (SFSH)

A principal component factor analysis conducted with varimax rotation restricted the solution to one factor for SFHS, with the factor explaining 56.48% of the variance.

Factor Structure for Subjective Authentic-Durable Happiness Scale (SA-DHS)

The Subjective Authentic-Durable Happiness Scale consists of 16 items. The unhappiness items (item 8=”Descontentamento”, item 13=”sentir-se mal” and item 16=”Infelicidade”), are fillers. They were only included in the measure to control for compliance bias, but not included in the analyses.

PCA with varimax rotation resulted in 2 factors.

An exploratory principal components factor analysis with varimax rotation was conducted. The factor analysis resulted in two factors. The first factor explained 39.10% of the variance, and the second factor explained 25.71% of the variance.

The Table 22 shows the factor loadings and the subscales that the items loads on. Values below .30 were omitted. Item 15 loaded on the contentment subscale.

Table 22. Factor loading for SA-DHS, Total sample

Scale Items	F1 Contentment	F2 Inner Peace
SA-DHS 4 "*Êxtase (felicidade que parece completa)*"	.84	
SA-DHS 2 "*Felicidade*"	.77	.37
SA-DHS 3 "*Prazer*"	.77	.31
SA-DHS 9 "*Beatitude (felicidade perfeita)*"	.76	
SA-DHS 15 "*Plenitude (sensação de satisfação absoluta, felicidade, realização total)*"	.76	
SA-DHS 11 "*Realização total*"	.69	.31
SA-DHS 1 "*Bem-estar geral*"	.68	.38
SA-DHS 6 "*Satisfação*"	.64	.55
SA-DHS 12 "*Alegria*"	.49	.28
SA-DHS 7 "*Serenidade*"	.31	.78
SA-DHS 14 "*Tranquilidade (calma* interior)"	.37	.73
SA-DHS 10 "*Paz interior*"		.75
SA-DHS 5 "*Paz de espírito*"	.46	.74

SA-DHS was treated as one dimensional, and then two separate dimensions: Contentment and Inner Peace subscales.

Item 15 loaded on the Contentment factor.

III. B. Descriptive statistic, total sample

Results will be presented in two parts:

1. Demographic factors

2. Auto-evaluation for individual factors that improve or disturb happiness

Part 1, Demographic Factors

Age

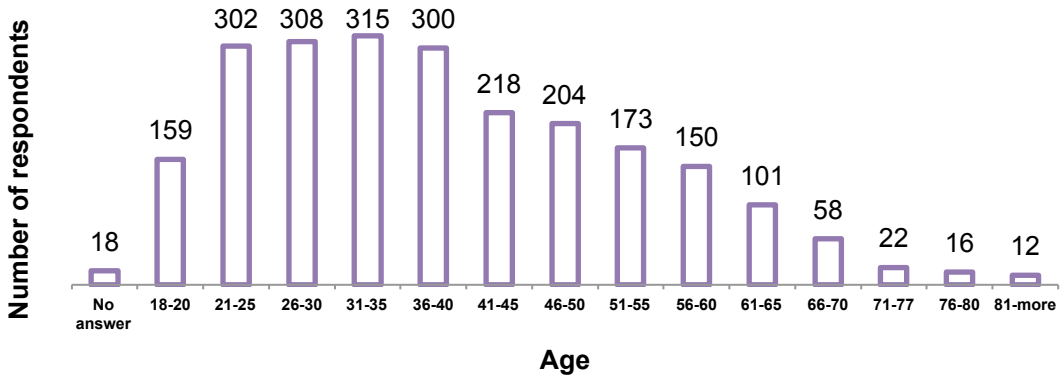


Figure 21. Age, Total sample

Total sample had a total of 2356 respondents. The minimum age was 18 years old and the maximum was 91 years old. Mean was 39 years old (mean=39.12; SD=14.38).

Marital status

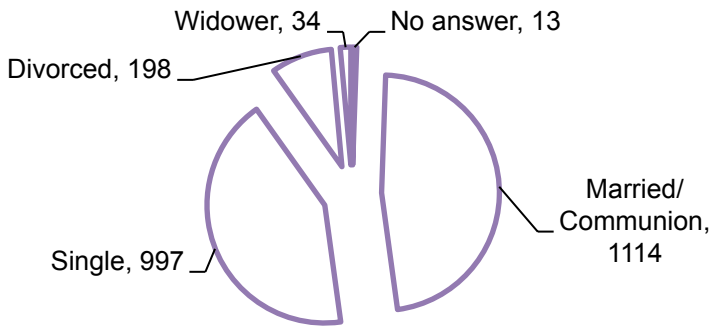


Figure 22. Marital status, Total sample

47.5% of respondents were married or lived in communion; 42.6% were single; 8,5% were divorced and 1.4% were widower.

Gender

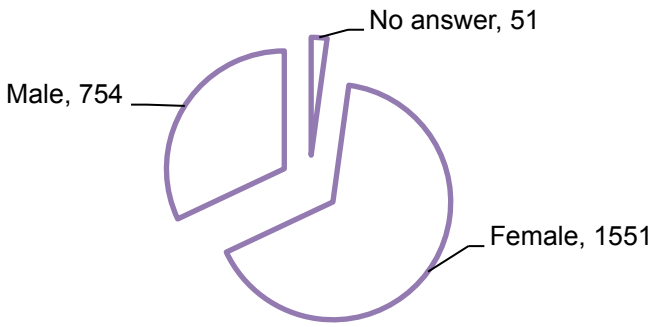


Figure 23. Gender, Total sample

For total sample 67.3% of respondents were female and 32.7% were male.

Had children

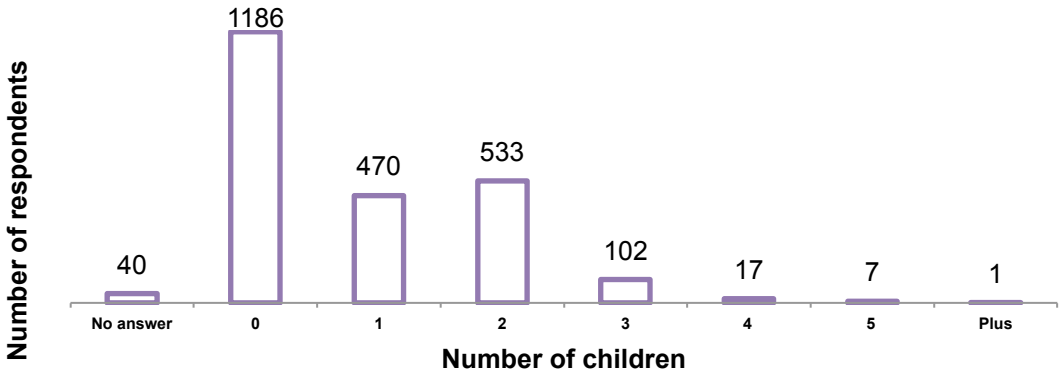


Figure 24. Had children, Total sample

51.2% of respondents had no children; 20.3% had 1child; 23.0% had 2 children; 4.4% had 3; and 1% had 4 or more children.

Occupation

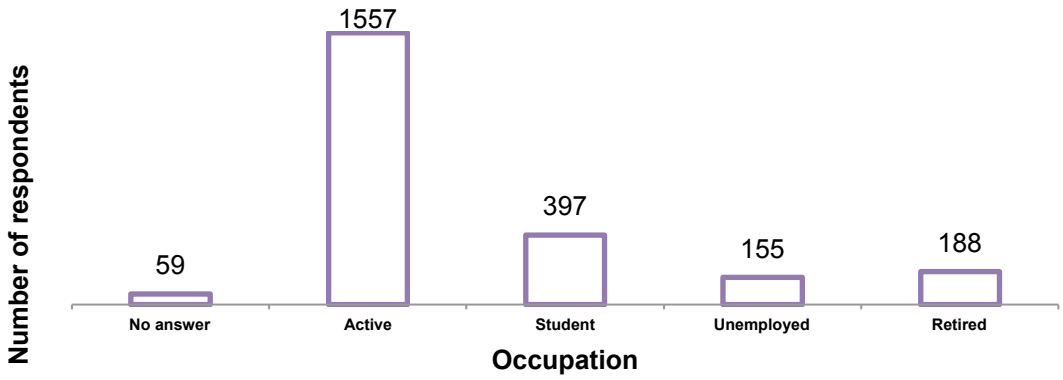


Figure 25. Occupation, Total sample

67.8 % were employed (active people); 17.3% students; 8.2% retired and 6.7% were unemployed.

Housing Region

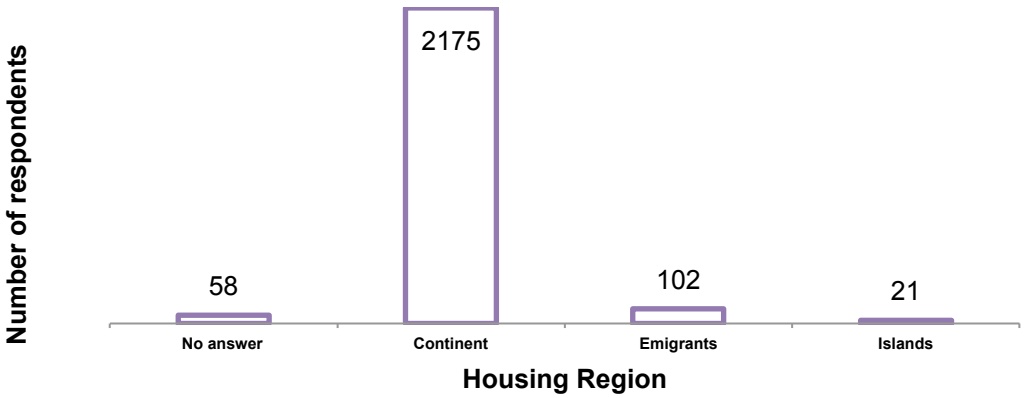


Figure 26. Housing region, Total sample

94.6% of respondents lived in the Portuguese Mainland; 4.4% were emigrant in different countries and .9% lived on Madeira or Azores Islands.

Districts and Islands

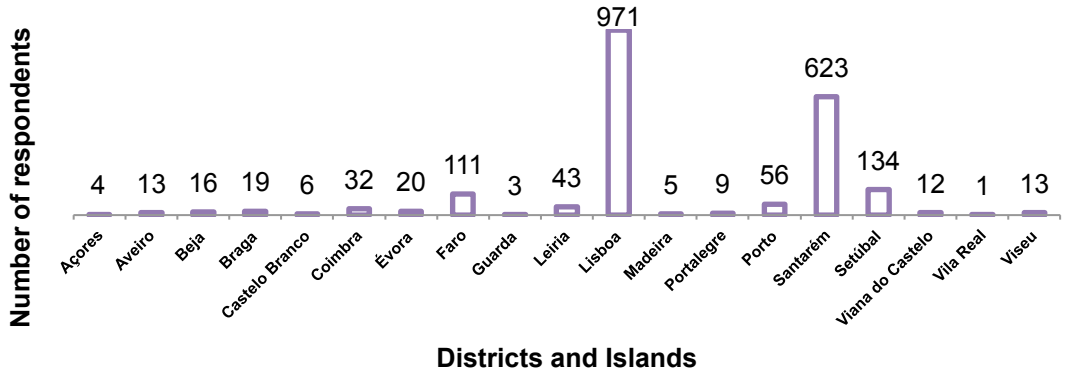


Figure 27. Districts and Islands, Total sample

Answers were collect from all districts in Mainland, and from Portuguese Islands.

Countries

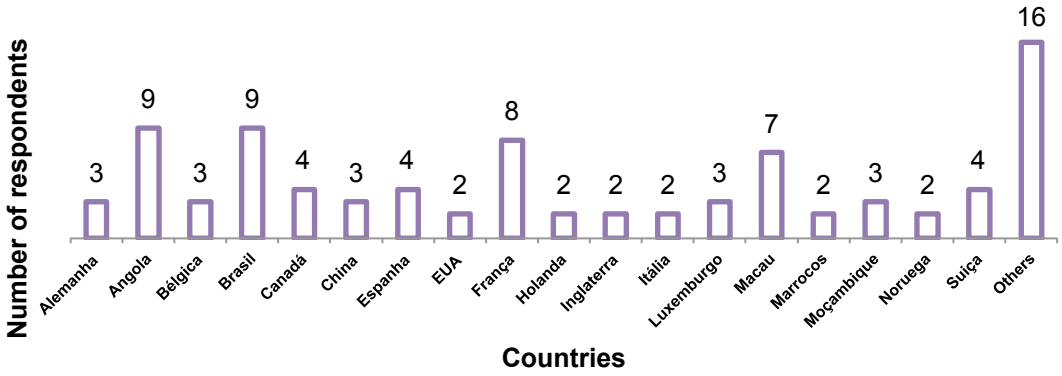


Figure 28. Countries, Total sample

Answers were collected from Portuguese emigrants from over more than 30 different countries.

Level of education

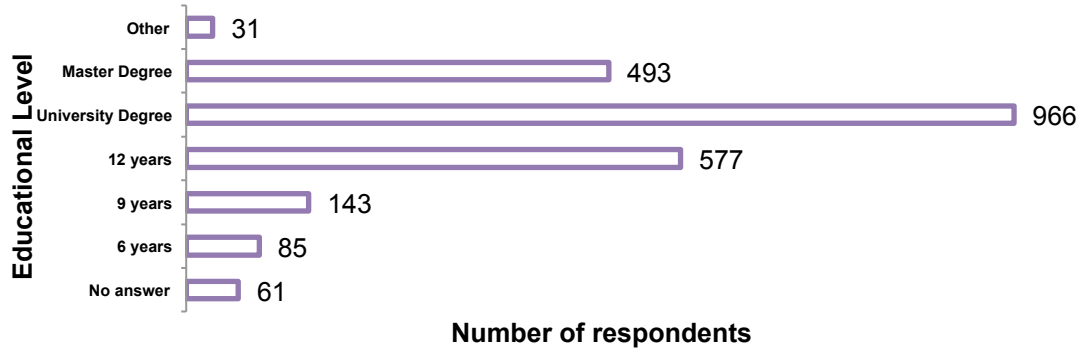
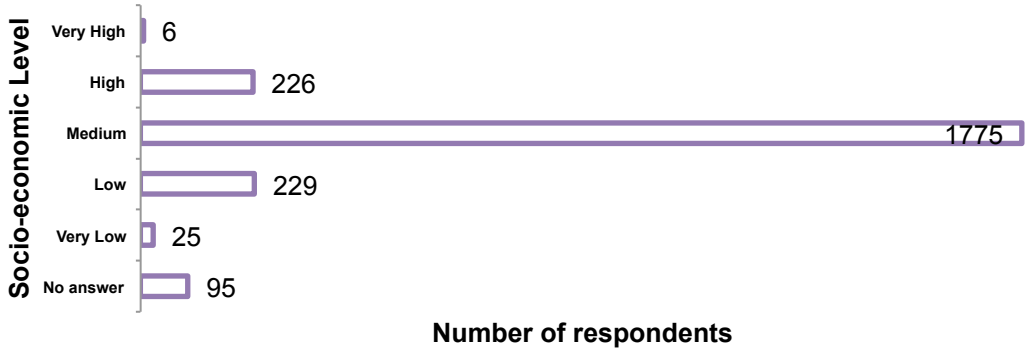


Figure 29. Level of education, Total sample

42.1% of respondents had a university degree; 25.1 % 12 years of schooling; 21.5% a master degree; 6.2% 9 years of schooling; 3.7% had 6 years of schooling; and 1.4% of respondents had some other degree.

Socio-economic level



.

Figure 30. Socio-economic level, Total sample

78.5% of respondents considered themselves as having a medium socioeconomic level; 10.1% a low level; 10.0% a high level; 1.1% a very low level and 0.3% a very high socioeconomic level.

Religious involvement

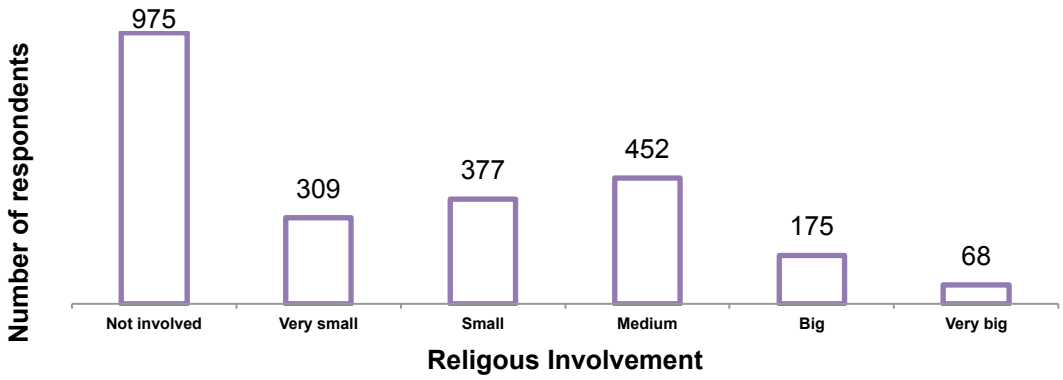


Figure 31. Religious involvement, Total sample

51% of the respondents professed a religion and 49 % of them said they did not profess any religion.

From those who professed a religion 32.7 % had a medium involvement; 27.3% had a small involvement; 22.4% a very small; 12.7% a big and 4.9% refers a very big involvement on religion.

Practice sports

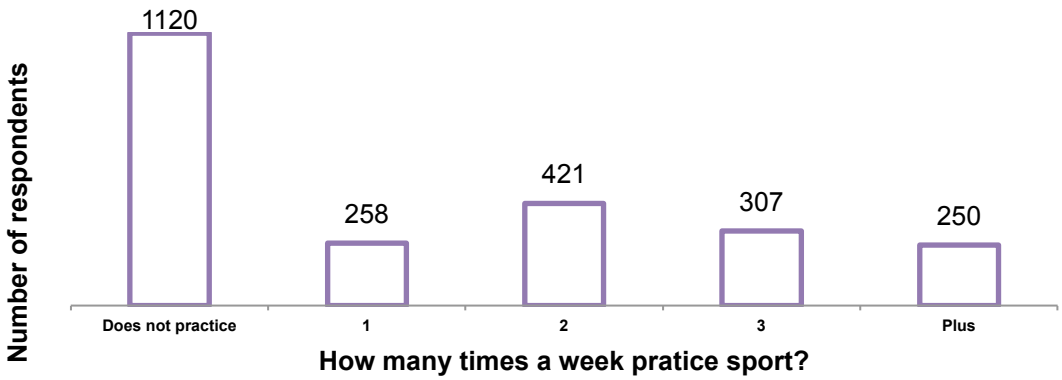


Figure 32. Practice sport, Total sample

53.6% of respondents did not practice any sport, and 46.4 % practiced at least one sport.

From those who practiced any sport 34.1 % of respondents did it twice a week; 24.8 % three times a week; 20.9% once a week, and 20.2 % practices sport more than 3 times a week.

Part 2. Auto-evaluation for individuals factors that improve or disturb happiness

Individual factors that improve happiness

Table 23. Individual Factors that Improve Happiness, Total sample

	Economic Stability	Family Stability	Inner peace	Professional Success	Other
First	7.7	47.0	38.3	2.6	7.5
Second	25.3	36.9	24.2	11.7	3.7
Third	36.4	10.1	19.5	32.6	2.9
Fourth	28.3	4.6	15.8	48.6	4.0
Fifth	2.3	1.4	2.2	4.6	82.0

Note: Values are presented in percentage

The factors that improve happiness are on Table 23.

Individual factors that disturb happiness

Table 24. Individual Factors that Disturb Happiness, Total sample

	Economic instability	Family instability	Emotional instability	Professional instability	Other
First	11.9	44.9	35.8	3.8	6.3
Second	24.2	35.6	26.9	12.3	2.0
Third	36.1	11.7	20.0	30.8	2.7
Fourth	26.2	6.4	16.1	50.0	1.8
Fifth	1.6	1.4	1.2	3.1	87.2

Note: Values are presented in percentage

The factors that disturb happiness are presented on Table 24.

Table 25. Descriptive Statistics, Total sample

		Mean	Std. Deviation	N
SFHS		3.58	1.21	2062
SA-DHS, full scale		4.61	1.00	2062
SA-DHS	Contentment	4.51	1.03	2062
	Inner peace	4.81	1.16	2062
Negative Affect		18.56	5.97	2062
Positive Affect		32.94	6.54	2062
SWLS		17.52	4.69	2062

III. C. Psychometric characteristics, for total sample

Table 26. Internal consistency, Total sample

		Cronbach's alpha (α)
SFHS		.90
SA-DHS, full scale		.93
SA-DHS	Contentment	.91
	Inner Peace	.83
Negative Affect		.88
Positive Affect		.85
Satisfaction With Life		.86

Convergent Validity

Convergent validity was assessed by correlating the two measures with positive affectivity, negative affectivity and the satisfaction with life scale. The bivariate correlations are presented on Table 27.

Based on the factor analyses and reliability analyses, SA-DHS was treated as having two sub dimensions (Contentment and Inner Peace subscales), and item 15 was treated as part of the Contentment sub-scale.

Table 27. Pearson's Correlation, Total sample

		1	2	3	4	5	6
1. SFHS							
2. SA-DHS		-.41**					
SA-DHS	3. Contentment	-.38**	.97**				
	4. Inner Peace	-.40**	.86**	.71**			
5. Negative Affect		.44**	-.37**	-.33**	-.39**		
6. Positive Affect		-.18**	.52**	.52**	.40**	-.02	
7. SWLS		-.37**	.67**	.68**	.50**	-.29**	.41**

Listwise N=2062b

Correlation is significant at the 0.01 level (2-tailed) **

Correlation is significant at the 0.05 level (2-tailed) *

Subjective Fluctuating Happiness was negatively correlated with Authentic-Durable Happiness (r= -.41**; p < .01); Contentment (r= -.38 **; p < .01); Inner Peace (r= -.40 **; p < .01); Positive Affect (r= -.18**; p < .01) and with Satisfaction With Life (r= -.37**; p < .01).

Authentic-Durable Happiness was negatively correlated with negative affect (r= -.37**; p < .01) and positively correlated with all the others: Contentment (r= .97 **; p < .01); Inner Peace (r= .86 **; p < .01); Positive Affect (r= .52**; p < .01) and with Satisfaction With Life (r= .67**; p < .01).

Contentment was negatively correlated with negative affect (r= -.33 **; p < .01); and positively with Inner Peace (r= .71**; p < .01); positive affect (r= .52**; p < .01) and satisfaction (r= .68**; p < .01).

Inner peace was negatively correlated with negative affect (r= -.39**; p < .01) and positively correlated with positive affect (r= .40**; p < .01) and satisfaction with life (r= .50**; p < .01).

Negative affect were negatively correlated with satisfaction with life (r= -.29 **; p < .01), authentic-durable happiness (r= -.37 **; p < .01), contentment (r= -.33 **; p < .01), and Inner Peace (r= -.39 **; p < .01); and were positively correlated with fluctuating happiness (r= .44 **; p < .01).

Positive affects were positively related with satisfaction with life (r= .41**; p < .01), authentic-durable happiness (r= .52 **; p < .01), contentment (r= .52 **; p < .01), and Inner Peace (r= .40 **; p < .01); and negatively correlated with fluctuating happiness (r= -.18 **; p < .01).

Discriminant Validity

Discriminant validity was assessed by correlating the two new measures with age, gender, education level, socioeconomic level and endorsement of religion.

Table 28. Discriminant validity, Total sample

		1	2	3	4	5	6	7	8
1. SFHS									
2. SADHS, full scale		-.42**							
SA-DHS	3.Contentment	-.38**	.97**						
	4. Inner Peace	-.41**	.86**	.70**					
5. Age		-.05*	-.08**	-.11**	-.00				
6. Gender		-.09**	.05*	.04	.04	.03			
7. EduLvRecoded		-.13**	.08**	.08**	.08**	-.06**	-.07**		
8. SocEco		-.10**	.15**	.16**	.10**	.07**	.04	.23**	
8. Religious Involv		-.05*	.04	.04	.03	-.00	-.01	.08**	.01

Correlation is significant at the 0.01 level (2-tailed) **

Correlation is significant at the 0.05 level (2-tailed) *

Listwise N=1982c

Note: “Educational_Level” as been recoded into “EduLv_Recoded”: code 6 as missing.

Fluctuating happiness was negatively correlated with educational level (r= -.13**; p < .01); socio-economical level (r= -.10**; p < .01) and religion (r= -.05*; p < .05).

Authentic-Durable Happiness was positively correlated educational level (r= .08**; p < .01) and socio-economical level (r= .15**; p < .01).

Authentic-Durable Happiness, contentment subscale, was positively correlated educational level (r= .08**; p < .01) and socio-economical level (r= .16**; p < .01).

Authentic-Durable Happiness, Inner Peace subscale, was positively correlated educational level (r= .08**; p < .01) and socio-economical level (r= .10**; p < .01).

Educational level was negatively correlated with fluctuating happiness (r= -.13**; p< .01) and is positively correlated with Authentic-Durable Happiness (r= .08**; p< .01), both contentment (r= .08**; p< .01) and Inner Peace (r= .08**; p< .01) subscales, and socio-economical level (r= .23**; p< .01).

Socio-economical level was negatively correlated with fluctuating happiness (r= -.10**; p< .01). It was positively correlated with Authentic-Durable Happiness (r= .15**; p< .01), both contentment (r= .16**; p< .01) and Inner Peace (r= .10**; p< .01) subscales, and educational level (r= .23**; p< .01).

DISCUSSION

Measures

To measure happiness, it must be made the main distinction between cognitive life evaluation and emotional reports, which need to be measured and analyzed separately ("World happiness report ", 2012).

Positive Affects (PA) and Negative Affect (NA) are two distinctive dimensions of affective states (Watson, Clark *et al.*, 1988). As Negative Affects are related to anxiety, neuroticism and self-reported stress, poor cooping and health complaints, Positive Affects are related to social activity, satisfaction and to the frequency of pleasant events having some correspondence with the main dominate personality factors of extraversion (Watson, Clark *et al.*, 1988).

To measure affects Watson, Clark and Tellegen developed in 1988 the Positive Affect and Negative Affect Scale: the PANAS (Watson, Clark *et al.*, 1988). In 1994, Watson and Clark created an expanded version of PANAS - the PANAS-X, providing for mood measurement at two different levels (Watson & Clark, 1994).

In this study was applied the PANAS because it is the most popular current scale of emotions (Diener, Wirtz *et al.*, 2010), largely used by several authors e.g. (Gable, Impett *et al.*, 2004; Gruber, Eidelman *et al.*, 2011; Gruber, Harvey *et al.*, 2009; Heller, Johnstone *et al.*, 2009; Howell, Chenot *et al.*, 2011; Ifcher & Zarghamee, 2014; Jacobs, Shaver *et al.*, 2013; Kemeny, Foltz *et al.*, 2011; Luo, Huang *et al.*, 2014; Lyubomirsky, Sousa *et al.*, 2006;

Nave-Leal, Pais-Ribeiro *et al.*, 2012; Ng & Diener, 2013; Parks, Porta *et al.*, 2012; Rocke, Li *et al.*, 2009; Ryff, Love *et al.*, 2006; Vie, Glaso *et al.*, 2012).

Life satisfaction is distinguishable from positive and negative affects (Pavot, Diener *et al.*, 1998) and should be measured apart from happiness (Beuningen, 2012) because life satisfaction is cognitive, and happiness and affects are more emotional than cognitive (Diener, Suh *et al.*, 1999).

Satisfaction With Life Scale (SWLS) was developed to measure life satisfaction as a whole; it does not include positive or negative affects, nor happiness or satisfaction on a specific domain in life, because it was been developed to measure life satisfaction in a global point of view (Beuningen, 2012).

Satisfaction With Life Scale (SWLS) presents an high level of internal consistency and high temporal reliability (Diener, Emmons *et al.*, 1985) and has been largely used by several authors (Arrindell, Heesink *et al.*, 1999; Bastian, Kuppens *et al.*, 2014; Beuningen, 2012; Boehm, Lyubomirsky *et al.*, 2011; Cohn, Brown *et al.*, 2009; Gable, Impett *et al.*, 2004; Gruber, Kogan *et al.*, 2013; Howell, Chenot *et al.*, 2011; Kern, Eichstaedt *et al.*; Le, 2010; Lee, Lin *et al.*, 2013; Lyubomirsky & Lepper, 1999; Lyubomirsky, Sousa *et al.*, 2006; Parks, Porta *et al.*, 2012; Ribeiro, 2012; Sato & Yuki, 2014; Slocum-Gori, Zumbo *et al.*, 2009; Steger, Kashdan *et al.*, 2008; Swami, Stieger *et al.*, 2009; Veenhoven, 2014f; Weytens, Luminet *et al.*, 2014).

Happiness keeps going on as a major theme since Greek philosophers (Grinde, 2012; Lyubomirsky & Lepper, 1999; Ruch, Martínez-Martí *et al.*, 2014; Veenhoven, 2004b) being largely studied by modern researchers (Dambrun, Ricard *et al.*, 2012; Grinde, 2012; Lyubomirsky, Sheldon *et al.*, 2005; Parks, Porta *et al.*, 2012; Robinson, Kennedy *et al.*, 2012; Veenhoven,

2004a) across nations (Brulé & Veenhoven, 2014; Dejonge, Veenhoven *et al.*, 2015; Veenhoven, 2012d; Veenhoven & Vergunst, 2013; "World happiness report ", 2012; "World happiness report ", 2013; "World happiness report," 2015).

Since Happiness can be measured using questionnaires (Csikszentmihaly & Hunter, 2003; Veenhoven, 2008; Veenhoven, 2011a, 2014f, 2015b), many scales to measure it have been developed and used (Dambrun, Ricard *et al.*, 2012), as can be read on Chapter I (Theoretical Introduction / Happiness / Scales).

Nevertheless, to Matthieu Ricard (Mind and Life Institute, USA) and Dambrun *et al.* (Blaise Pascal, Clermont Université, France) none of the existing scales to assess happiness and well-being seemed to focus on durables contentment and inner peace that characterized authentic-durable happiness (Dambrun, Ricard *et al.*, 2012). Consequently, in 2012 they developed two new measure (SFHS and SA-DHS) closely linked to their Self-centeredness/Selflessness Happiness Model – SSHM (Dambrun & Ricard, 2011).

Subjective Fluctuating Happiness Scale (SFHS) was developed as a scale to measure perceived fluctuating degrees of happiness whereas Subjective Authentic-Durable Happiness Scale (SA-DHS) was developed to access subjective authentic-durable happiness (Dambrun, Ricard *et al.*, 2012).

The novelties of these scales are being a valid instrument to measure fluctuation in happiness (SFHS), plus the durable dimension of happiness (SA-DHS) and their two related constructs: contentment and inner peace (Dambrun, Ricard *et al.*, 2012).

In fact, and in spite of the numerous and exponentially increasing number of the studies on this area (Veenhoven, 2004a), it seems that there is no one scale to access the mentioned dimensions of happiness (Dambrun, Ricard *et al.*, 2012).

Considering the explained reason above and the importance of this scale for research, the author of this thesis developed the validation of the two new measures, SFHS and SA-DHS, for Portuguese people.

Factor analysis

Statistical analyses were conducted independently for the online and the paper/pencil samples, as well as for the total sample, with similar results. The exploratory factor analysis with varimax rotation resulted in three factors, corresponding to SFHS items, and to contentment and inner peace items from the SA-DHS scale, which is according to the authors of the original scales (Dambrun, Ricard *et al.*, 2012).

Since SFHS is theoretically (Dambrun, Ricard *et al.*, 2012) one-dimensional and have one factor, a principal components factor analysis was conducted with varimax rotation restricting the solution to one factor.

Nine of the items had factor loadings ranged from .61 to .87. The only exception was item 1 (“I have had satisfactions and also great disappointments”), loading .39 and .41 online and paper pencil, respectively. As it was also the lowest loading item in the Dambrun *et al.* (2012) study, future research should consider revising the item 1. See Table 29.

Table 29. Comparative Factor Loading SFHS

Items	Online Survey	Paper/Pencil Survey	(Dambrun, Ricard *et al.*, 2012)
SFHS 1	.39	.41	.52
SFHS 2	.70	.70	.67
SFHS 3	.72	.66	.59
SFHS 4	.77	.76	.75
SFHS 5	.84	.84	.71
SFHS 6	.61	.57	.77
SFHS 7	.84	.85	.73
SFHS 8	.86	.87	.73
SFHS 9	.84	.84	.72
SFHS 10	.72	.72	.62

Damburn *et al.* (2012) reported statistics treating SA-DHS as one-dimensional and also reported statistics treating the scale as having two subscales – contentment and inner peace (Dambrun, Ricard *et al.*, 2012). To be conservative with those authors, an exploratory principal components factor analysis with varimax rotation was conducted; the results match perfectly with the original study with, also, two factors explaining the variance.

The factor loadings and the subscales that the items are theorized to load on are present on Table 30.

Table 30. Comparative Factor Loading SA-DHS

Scale Items	Online Survey		Paper/Pencil Survey		(Dambrun, Ricard *et al.*, 2012)		Theorized Subscale
	Contentment	Inner Peace	Contentment	Inner Peace	Contentment	Inner Peace	
SA-DHS 1	.63	.46	.78		.70		Contentment
SA-DHS 2	.73	.44	.83		.83		Contentment
SA-DHS 3	.74	.38	.81		.83		Contentment
SA-DHS 4	.84		.81		.69		Contentment
SA-DHS 5	.37	.82	.53	.65		.67	Inner Peace
SA-DHS 6	.60	.60	.66	.52	.59		Contentment
SA-DHS 7		.83	.31	.71		.69	Inner Peace
SA-DHS 8							Unhappiness
SA-DHS 9	.79		.65	.32	.56		Contentment
SA-DHS 10	.32	.85		.73		.74	Inner Peace
SA-DHS 11	.69	.32	.62	.42	.64		Contentment
SA-DHS 12	.60	.51	.50		.75		Contentment
SA-DHS 13							Unhappiness
SA-DHS 14	.31	.82	.39	.73		.75	Inner Peace
SA-DHS 15	.77	.32	.67	.39		.66	Inner Peace
SA-DHS 16							Unhappiness

Note: Items 8, 13 and 16 are three negatively valenced items corresponding to unhappiness; that are not used. Unhappiness items are fillers; they were not included in the analyses. They were only included in the measure to control for compliance bias (Dambrun, Ricard *et al.*, 2012). Values below .30 were omitted.

As it can be seen in the Table 30, several items load on both factors. However, to a great extent, the results of this study are consistent with those by Dambrun *et al.* (2012). The only two exceptions are items 15 and 6. Item 15 is theorized to reflect inner peace; however, in this study, it is loading on the Contentment subscale. Based on the factor analyses and reliability analyses, item 15 (“Plenitude, feeling of complete satisfaction, happiness and fullfilment") was treated as part of the contentment sub-scale. Item 6 (“Satisfaction”) loaded equally high on both subscales.

Furthermore, it was clear from this studies that SA-DHS is comprised of two sub dimensions, corroborating Dambrun *et al.* (2012).

Internal consistency of the scales

Table 31. Comparing Internal Consistency of the Scales, Online and Paper/pencil samples

	Number of items	Online Sample	Paper /Pencil Sample	(Dambrun, Ricard *et al.*, 2012)
SFHS				
All scale (10 items)		.90	.90	.89
SA-DHS				
All scale (13 items)	13	.95	.90	.93
Contentment				
Without item, 15 as Dambrun *et al.,* 2012 (8 items)	8	.92	.87	.90
With item 15 (9 items)	9	.93	.89	
Inner Peace				
With item 15 as Dambrun *et al.,* 2012 (5 items)	5	.91	.76	.87
Without item 15 (4 items)	4	.92	.72	

The internal consistency of all scales was high, both on online survey and on paper/pencil survey methods.

In this study, Cronbach's alpha was high and similar to those presented on Dambrun *et al.*, 2012 study.

The Portuguese version of SFHS and SA-DHS presented, both on online and on paper/pencil survey methods, an internal consistency high and similar to those presented on the study by Dambrun *et al.* in 2012, as it can be seen on Table 31.

Comparing Mean values and SDs

Online / Paper/pencil

Table 32. Comparing Convergent Validity, Online and Paper/pencil samples

		Online Survey		Paper /Pencil Survey		(Dambrun, Ricard *et al.*, 2012)	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
SFHS		3.50	1.22	3.67	1.18	3.92	1.24
SA-DHS	Full scale	4.56	.99	4.65	1.00	4.31	1.01
	Contentment	4.46	1.00	4.58	1.05		
	Inner Peace	4.80	1.14	4.82	1.18		
NA		18.49	6.49	18.63	6.60		
PA		33.09	5.78	32.76	6.19		
SWLS		17.28	4.79	17.78	4.57		

Table 33. Comparing α, Mean values and Std. Deviation of the Total Sample, with original scales

		Complete Sample			Dambrun		
		α	Mean	St. Deviation	α	Mean	St. Deviation
SFHS		.90	3.58	1.20	.89	3.92	1.24
SA-DHS	Full scale	.93	4.60	1.00	.93	4.31	1.01
	Contentment	.91	4.51	1.03	.90		
	Inner Peace	.83	4.80	1.16	.87		
NA		.88	18.56	5.97			
PA		.85	32.94	6.54			
SWLS		.86	17.52	4..69			

Mean and Standard Deviation were similar for all samples. Nevertheless, they do not match those found on the study by Dambrun *et al* (Dambrun, Ricard *et al.*, 2012). Despite Portuguese people presented the mean value for subjective fluctuating happiness (mean= 3.58) lower than French (mean= 3.92), with statistic significancy (t (2165)= -13.26; p= .000), Portuguese people scored (mean= 4.60) strongly higher (t(2136)= 13.48; p=

.000) on subjective authentic-durable happiness than French population (mean= 4.31) (Dambrun, Ricard *et al.*, 2012).

However this results should be interpreted with caution untill more researchers with subjective fluctuating and authentic-durable happiness among different countries are done.

According to WDH data, between 2000 and 2009, in a 0 to 10 scale, Portugal scored 5.7, ranking a 110 position. As well as France scored 6.6 and ranked a 47 position in the average happiness stated in 149 nations (Veenhoven, 2000-2009). For more details see Appendix 8.

Furthermore, the 2013 WHR results, presented France having an average in happiness about 6.76, ranking the 25 position. Meanwhile, Portugal scored 5.10 and ranked on the 85 position. Results from WHR, 2015 are similar to those. Please see Appendix 9, for more details.

Considering that the average happiness among all nations was 5.16 per 156 nations in the WHR, 2013 and 5.34 for the 158 countries in the 2015 WHR, it should be emphasized how important other measures (such as GDP *per capita*, social support, healthy life expectany at birth, freedom to make choices, generosity perceptions of corruptions PA and Na, as WHR does (Helliwell, Huang *et al.*, 2015; "World happiness report," 2015) are for ranking happiness in countries. See appendix 10.

However, the SFHS and SA-DHS scales should be considered appropriated not only to distinguish between fluctuating and authentic-durable happiness but also to evaluate both individually, as well as to evaluate the constructs of contentment and inner peace.

Convergent validity of the scales

To assess convergent validity the correlation between the Portuguese version of SFHS and SA-DHS and the measures for well-being (SWLS), and for positive and negative affect (PANAS) has been done. This analysis was run for each sample. The results for total sample are presented in Table 33. Pearson's correlation comparing online and PP sample presented similar results and could be seen on (Appendix 2).

Detailed results for convergent validity has been presented for total sample and can be examined on Table 27.

In a broader point of view, this study places emphasis on the ideia that happiness has multiple facets, such as satisfaction with life, and the presence of positive emotions over the negative ones (Cohn, Brown *et al.*, 2009; Lee, Lin *et al.*, 2013). Whereas Subjective Fluctuating Happiness was negatively correlated with Positive Affect (r= -.18**; p< .01) and with Satisfaction With Life (r= -.37**; p< .01), it was positively related (r= .44**; p< .01) with Negative Affect. These results perfectly matches those presented by the authors of the scales (Dambrun, Ricard *et al.*, 2012), but also are in agreement with the statement that people who have experienced positive emotions are more likely to report increased life satisfaction. By other hand, people who have experienced negative emotions report a lower life satisfaction (Bastian, Kuppens *et al.*, 2014).

Furthermore, the Authentic-Durable Happiness was negatively correlated with Negative Affect (r= -.37**; p< .01) and positively correlated with Positive Affect (r= .52**; p< .01) and with Satisfaction With Life (r= .67**; p< .01). These results were very similar to those presented by the authors of the A-DH scale (Dambrun, Ricard *et al.*, 2012). In adition, these results

reinforce the ideia that positive emotions are closely linked to happiness (Bastian, Kuppens *et al.*, 2014).

Moreover, the correlation found between subjective authentic-durable happiness and life satisfaction (r= .67**; p< .01), is similar to that presented in a study (Uysal, Satici *et al.*, 2014) with SWLS and the subjective happiness scale (SHS), developed by Lyubomirsky and Lepper (Lyubomirsky & Lepper, 1999), emphasizing the relationship between life satisfaction and subjective happiness (Uysal, Satici *et al.*, 2014).

The positive correlation observed in the present study between inner peace and life satisfaction, positive affects and authentic-durable happiness perfectly match those presented for the construction of "Peace of Mind Questionnaire", shortly named PoM, and recently presented to the scientific community by Barbara Fredrickson (Lee, Lin *et al.*, 2013). Further investigation, by applying simoultaneously SA-DHS and PoM, will show if this concept are so related as they appear to be, in what concerns definition, results and correlations (Lee, Lin *et al.*, 2013).

Correlations have been done within three components of SWB: the two affective and emotional aspects, positive and negative affect (PA and NA), and the cognitive-judgmental one, the life satisfaction (SWLS) by several authors (Diener, Emmons *et al.*, 1985; Morinville, Miranda *et al.*, 2013).

The results of this study showing a strong positive correlation between PA and satisfaction with life, corroborate several previous studies (Boehm, Lyubomirsky *et al.*, 2011; Morinville, Miranda *et al.*, 2013; Watson, Clark *et al.*, 1988). Indeed, Sonja Lyubomirsky defined PA as being the basic constituent of happiness (Lyubomirsky, King *et al.*, 2005). Around the world life satisfaction is significantly related with the experience of positive emotions

(Bastian, Kuppens *et al.*, 2014); as well as positivity is linked to happiness (Catalino, Algoe *et al.*, 2014) it was expectable that in this study, Positive Affects was equally, strongly and positively related to authentic-durable happiness. Furthermore, this study seems to be consonant with Fredrickson's Broaden and Build Theory of positive emotions on the fact that when people experiences positive emotions, global life satisfaction can arise (Cohn, Brown *et al.*, 2009).

NA that has been related to self reported stress by some authors (Vie, Glaso *et al.*, 2012; Watson, Clark *et al.*, 1988) was, in the present study, related with subjective fluctuating happiness, which is in agreement with the previous study using the new scales (Dambrun, Ricard *et al.*, 2012).

Discriminant validity of the scales age, gender , educational and socio economical level

The discriminant validity run in this study does not corroborate those results presented by the authors (Dambrun, Ricard *et al.*, 2012) of the new scales in what concern the relation between SFHS and SA-DFH with educational level, age or religiosity. Dambrun et al., 2012, found no correlation, whereas in this study educational and socioeconomic level were negatively related to SFHS and positively related to authentic durable happiness. This result is in agreement with those authors who consider education as having a large effect on happiness (Argyle, 2001), and also with the concept that, although education has no direct impact on happiness, they are related by the better income, employability, job security and faster

promotion education would provide (Layard, Clark *et al.*, 2012; "World happiness report ", 2012).

In what concern the relationship with the socioeconomic levels, this study is in line with those reporting income as having a positive correlation with happiness (Bhattacharjee & Mogilner, 2014; Diener, Ng *et al.*, 2010; Diener & Seligman, 2004; Robinson, Kennedy *et al.*, 2012; "World happiness report ", 2012; "World happiness report ", 2013; "World happiness report," 2015) and being GDP *per capita* one of the 6 more determinantes variableskeys for happiness between countries and regions (Helliwell, Huang *et al.*, 2015).

In this study religiosity was negatively related to SFH but not with SA-DH, which is matching the concept that religious involvement is associated with happiness (Cooper, Bebbington *et al.*, 2011; Okulicz-Kozaryn, 2011), with satisfaction with life (Robinson, Kennedy *et al.*, 2012) and with well-being (Okulicz-Kozaryn, 2011).

Regarding age, which was negatively related to SA-DHS, and taking into account that in this study, the complete sample presented a mean of 39 years, these results fit the U-shaped pattern observed in many countries and in several continents with life satisfaction reaching a minimum in middle-age ("World happiness report ", 2012).

CONCLUSIONS

From the study developed for the Validation of SFHS and SA-DHS for Portuguese people the following conclusions can be drawn:

1. SFHS seem to be a transcultural measure
2. The Portuguese versions for Subjective Fluctuating Happiness Scale (SFHS] present a logical and adequate factor structure, high internal consistency and adequate convergent construct validity.
3. The Portuguese version of SFHS could be applied both on online or on paper pencil surveys methods, with similar psychometric properties.
4. The Portuguese version of SFHS is a valid, reliable and adequate measure to assess fluctuating happiness of the Portuguese population.
5. Portuguese people presented low level of fluctuating happiness
6. Subjective fluctuating happiness on Portuguese population was negatively correlated with positive affect and satisfaction with life.
7. Subjective fluctuating happiness on Portuguese population was negatively correlated with the religious involvement and with both educational and socio-economic levels.
8. Subjective fluctuating happiness on Portuguese population is negatively correlated with authentic-durable happiness, contentment and inner peace.

9. The Portuguese versions for SA-DHS present a logical and adequate factor structure, high internal consistency and adequate convergent construct validity.
10. SA-DHS is a transcultural measure.
11. The Portuguese version of SA-DHS can be applied using both online or paper pencil survey methods, with similar psychometric properties.
12. The current study supports validity of three different factors to measure the subjective happiness, and also to make the distinction between the two distinct markers for authentic-durable happiness: inner-peace and contentment.
13. The Portuguese version of SA-DHS is a valid, reliable and adequate measure to assess authentic-durable happiness, in the Portuguese population.
14. The Portuguese version of SA-DHS subscales present good psychometric properties for measuring contentment and inner peace constructs.
15. The Portuguese version of SA-DHS contentment subscale consists on items 1, 2, 3, 4, 6, 9, 11,12 and 15.
16. The Portuguese version of SA-DHS subscale Inner-peace contains items 5, 7, 10 and 14.
17. Portuguese people presented high level of authentic-durable happiness
18. Authentic-durable happiness was negatively correlated with Negative Affect, among Portuguese people.

19. Authentic-durable happiness was positively correlated with positive affect, satisfaction with life and with the educational and socio-economical levels, among Portuguese people.
20. Positive emotions and positive thoughts, even those self-generated, have a close relationship with both physical and mental health in a self-sustaining and dynamic upward-spiral
21. Emotional stability is associated to psychological health and happiness

CHAPTER III

STRESS, MUSCULOSKELETAL COMPLAINTS AND HAPPINESS IN PORTUGUESE DENTISTS, STUDY2

OBJECTIVES AND HYPOTHESIS

The main purpose of Study2 was:

-To evaluate perceived stress in Portuguese dentists

-To evaluate the presence of symptoms / complaints of musculoskeletal disorder in Portuguese dentists

-To evaluate fluctuating happiness levels on Portuguese dentists

-To evaluate authentic-durable happiness levels in Portuguese dentists

From the objectives mentioned above the following hypotheses were formulated for Study2:

$H_{1.}0$. There is no significant difference on stress level between Portuguese dentists and the Portuguese general population

$H_{1.}1$. There is a significant difference on stress level between Portuguese dentists and the Portuguese general population

$H_{2.}0$. There is no significant difference on the prevalence of musculoskeletal disorders complaints between Portuguese dentists and the Portuguese general population

$H_{2.}1$. There is a significant difference on the prevalence of musculoskeletal disorders complaints between Portuguese dentists and the Portuguese general population

$H_{3.}0$. There is no significant difference on the prevalence of fluctuating happiness between Portuguese dentists and the Portuguese general population

$H_{3.}1$. There is a significant difference on the prevalence of fluctuating happiness between Portuguese dentists and the Portuguese general population

$H_{4.}0$. There is no significant difference on the prevalence of authentic durable happiness between Portuguese dentists and the Portuguese general population

$H_{4.}1$. There is a significant difference on the prevalence of authentic durable happiness between Portuguese dentists and the Portuguese general population

TYPE OF STUDY

This is an observational cross-sectional survey type of study.

METHODOLOGY

Procedures

Before conducting the main survey a pilot test was developed and applied with the purpose of testing methodology, detecting some potential practical problems, and testing some specific details of the survey, such as, if the questions were easily understood and how long would it take to complete the questionnaire.

Pilot test, Study2

Ethical consideration for Pilot test, Study2

Permission was requested and granted to survey assistant professors at the Faculdade de Medicina Dentária da Universidade de Lisboa. See Appendix 6 and Appendix 7.

All subjects surveyed were informed about the scientific purpose of the study, and were asked to participate and give feedback on difficulties found on answering the questionnaires.

Sample, Pilot test, Study2

A convenient sample of 45 dentists, ranging age from 23 to 59, differing in year of graduation (17 different), curriculum vitae (encompassing DMD, MD, PhD and Post Doc) and district of practice (five different) were used in this study. Participants were also asked both to identify any difficulty and provide suggestions and concerns related to the completion of the questionnaire.

For more details see Table 34.

Measures, Pilot test, Study2

1. Portuguese version of the General Health Questionnaire (GHQ-12 items)

The GHQ-12 items is a self report questionnaire developed by Goldberg and Hillier in 1979 (Ribeiro & Antunes, 2003), to measure psychological distress (Laranjeira, 2008; Perez-Padron, Bernabé *et al.*, 2010; Resende, 2009).

GHQ is a well-established instrument largely used all over the world (Abu-Ghazaleh, Rajab *et al.*, 2011; Carochinho, 2006; Dias, Ramos *et al.*, 2002; Goldberg, Gater *et al.*, 1997; Groter, Freeman *et al.*, 2008; Guthrie, Black *et al.*, 1997; Kawada & Otsuka, 2012; Laranjeira, 2008; Lesage, Martens-Resende *et al.*, 2011; Newton & Gibbons, 1996; Padrón, Galán *et al.*, 2012; Resende, 2009; Ribeiro & Antunes, 2003; Sweeting, Young *et al.*, 2009;

Zulkefly & Baharudin, 2010), and has been translated in 38 languages (Resende, 2009).

The Portuguese GHQ-12 version used in this study is the Portuguese adaptation of the General Health Questionnaire (Laranjeira, 2008). The author granted permission for its use.

2. Musculoskeletal Questionnaire (MSQ)

The use of a questionnaire is a valid way to obtain information about MS pain (Paananen, Taimela *et al.*, 2011).

The musculoskeletal questionnaire (MSQ) used in this study was developed from the Portuguese version (Mesquita, 2011) and the Portuguese adaptation (Serranheira, Pereira *et al.*, 2003) of the Standardized Nordic Musculoskeletal Questionnaire (Kuorinka, Jonsson *et al.*, 1987). Both Portuguese authors granted permission to use both scales.

The Standardized Nordic Musculoskeletal Questionnaire (SNMQ) published on 1987 is the outcome of the work of a Nordic team supported by the Nordic Council of Ministers. They undertook the project to develop and standardized questionnaires for the analysis of musculoskeletal symptoms (MSS) in general, and for low back and neck / shoulders complaints. The text has been translated into four Nordic languages and applied in more than 100 different projects and 50000 persons before Standardized Nordic Musculoskeletal Questionnaire come out to be published for the scientific community (Kuorinka, Jonsson *et al.*, 1987).

SNMQ is a valid and reliable questionnaire (Kuorinka, Jonsson *et al.*, 1987; Tanikonda & Koneru, 2014) in what concerns the measuring of the prevalence of MS complaints (Griffiths, Mackey *et al.*, 2011; Hayes, Cockrell *et al.*, 2009).

The Standardized Nordic Musculoskeletal Questionnaire (SNMQ) developed by Kuorinka *et al.* (1987) can be used, as well as a self-administered questionnaire or in interviews, with the main purpose to screen for musculoskeletal disorders in an ergonomic context (Kuorinka, Jonsson *et al.*, 1987). It has been largely applied in several studies (Descatha, Roquelaure *et al.*; Feng, Liang *et al.*, 2014; Hayes, Cockrell *et al.*, 2009; Palliser, Firth *et al.*, 2005; Pinheiro, Tróccoli *et al.*, 2002; Rafeemanesh, Jafari *et al.*, 2013; Ratzon & Mizrachi, 2008; Rodrigues & Pedro, 2013; Tanikonda & Koneru, 2014; Tezel, Kavrut *et al.*, 2005).

3. Portuguese version of Subjective Fluctuating Happiness Scale (SFHS).

Subjective Fluctuating Happiness Scale is a 10 items questionnaire developed by Michael Dambrun (Université Blaise Pascal, France), Matthieu Ricard (Mind and Life Institute, USA) and Colleagues to measure subjective fluctuating happiness (Dambrun, Ricard *et al.*, 2012).

This measure was developed in Study I - Validation of Subjective Happiness Scales for Portuguese population. See chapter II or Appendix 1**,** for the Portuguese version of the scales.

4. Portuguese version of Subjective Authentic-durable Happiness Scale (SA-DHS).

Subjective Authentic-Durable Happiness Scale is a 16 items questionnaire developed by Michael Dambrun (Université Blaise Pascal, France), Matthieu Ricard (Mind and Life Institute, USA) and Colleagues to access subjective authentic-durable happiness. Three of the 16 items are negatively valenced and measure unhappiness (Dambrun, Ricard *et al.*, 2012).

This measure was developed in Study I - Validation of Subjective Happiness Scales in Portuguese people. See chapter II or Appendix 1, for the Portuguese version of the scales.

Results, Pilot test

Values for reliability of applied scales were: .88. for Subjective Fluctuating Happiness Scale (SFHS); .84 for Subjective Authentic-Durable Happiness Scale (SA-DHS); and .79 for General Health Questionnaire (GHQ).

Table 34. Pilot Test results for Cronbach's Alpha, Mean and St. Deviation

Pilot Test				
		α	**Mean sum**	**St. Deviation**
SFHS		.88	30.98	11.58
	Full Scale	.84		
SA-DHS	Contentment	.94	20.07	4.34
	Inner Peace	.93	44.22	8.61
GHQ		.79	21.98	3.92

Results for mean and Cronbach's Alpha of scales used in the pilot test were considered adequate to apply the battery pack of questionnaires on dentists.

"Prova de Acesso Pedagógico"

Presentation of the final project to the Scientific Committee of Psychology and Dentistry at Faculdade de Medicina Dentária da Universidade de Lisboa (FMDUL).

The final project for this thesis was submitted to a Scientific Committee of Psychology and Dentistry, at the Faculdade de Medicina Dentária da Universidade de Lisboa, on 2014 January 16.

Although results from the Pilot test confirmed that all scales were adequate to survey dentists, some changes had to be made to the questionnaires. For example, the question about the usual position dentists

used to work was removed because almost all (95.5%) of respondents named sitting position as the usual position of working. Furthermore, there were two remarkable changes between the pilot test and the final survey, both as a result of the presentation of the final project of this thesis to the Scientific Committee of FMDUL. The change was related to the musculoskeletal questionnaire. As it was irrelevant for this study to know if complaints were related to the right or the left side, these specifications were removed from the questionnaire, in order to simplify the subsequent statistical analysis. A final questionnaire for musculoskeletal complaints used on this investigation, was developed and also adapted for the dentist population, by the author of this thesis, keeping questions within the limits of the study.

The second important change on the battery of questionnaires administered was the replacement of the General Health Questionnaire by a more focused scale on stress. With this purpose, a research of the literature was done (Abu-Ghazaleh, Rajab *et al.*, 2011; Cohen, Kamarck *et al.*, 1983; Dimatteo, Shugars *et al.*, 1993; Gorter, Freeman *et al.*, 2008; Gorter, Albrecht *et al.*, 1998; Guthrie, Black *et al.*, 1997; Luft, Sanches *et al.*, 2007; Myers & Myers, 2004; Newton, Allen *et al.*, 2006; Park, Chung *et al.*, 2012; Remor, 2006; Ribeiro & Marques, 2009; Rout, 1999; Schmitter, Liedl *et al.*, 2008; Tabak & Koprak, 2007; Taskaya-Yilmaz, Ceylan *et al.*, 2004; Toews, Lockyer *et al.*, 1997; Trigo, Canudo *et al.*, 2010).

Among all different scales for stress, the Perceived Stress Scale developed by Cohen *et al.* (1983), and also used in some dentists surveys (Dimatteo, Shugars *et al.*, 1993; Myers & Myers, 2004), was chosen and considered the appropriate scale for the evaluation of perceived stress (Cohen, Kamarck *et al.*, 1983; Dimatteo, Shugars *et al.*, 1993; Garland,

Gaylord *et al.*, 2011; Luft, Sanches *et al.*, 2007; Myers & Myers, 2004; Remor, 2006; Ribeiro & Marques, 2009; Trigo, Canudo *et al.*, 2010).

Sample, Study2

Sample size calculation

According to some authors as Tinsley & Tinsley *in* Moreira (2009), it is recommended to have from 5 to 10 answers for each item, until the limit of 300 (Moreira, 2009).

When the number of items is above 15, the minimum sample size is 5 for each item (Hill & Hill, 2012). In this case, as Subjective Fluctuating Happiness Scale has 10 items, Subjective Authentic-Durable Happiness Scale has 16 items, Perceived Stress Scale could have 10 or 13 items (respectively for short and full scale) and Musculoskeletal Questionnaire has 9 items, the sample size calculation for this study is 225 or 240 respondents (nº items x 5), minimum, depending on using short or full version of Perceived Stress Scale.

Target population

Portuguese dentists.

Measures

Perceived Stress Scale (PSS)

Stress was measured by using the Perceived Stress Scale (PSS) developed by Cohen *et al.* (1983). This widely applied scale (Dimatteo, Shugars *et al.*, 1993; Luft, Sanches *et al.*, 2007; Myers & Myers, 2004; Ramadoss & Bose, 2010; Remor, 2006; Ribeiro & Marques, 2009; Sibille, Langaee *et al.*, 2012; Trigo, Canudo *et al.*, 2010) was created to measure the degree to which people evaluate stressful situations in their lives (Cohen, Kamarck *et al.*, 1983; Dimatteo, Shugars *et al.*, 1993; Luft, Sanches *et al.*, 2007; Remor, 2006; Trigo, Canudo *et al.*, 2010; Weytens, Luminet *et al.*, 2014).

Originally the PSS was comprised by 14 items (Cohen *et al.,* 1983), but researchers can also count on two short scales: a 10 items (PSS-10) and a brief 4 items (PSS-4) scale that Cohen *et al.,* created for telephone interviews (Cohen, Kamarck *et al.*, 1983; Luft, Sanches *et al.*, 2007; Trigo, Canudo *et al.*, 2010). However, the Portuguese version validated by Ribeiro and Marques (2009) has 13 items based on the author's factor analyses.

Perceived Stress Scale is a brief and easy scale to administer, with the adequate psychometric properties (Cohen, Kamarck *et al.*, 1983), both for full and short 10-items versions (Luft, Sanches *et al.*, 2007; Remor, 2006; Trigo, Canudo *et al.*, 2010).

This study used the Portuguese version developed by Ribeiro and Marques (2009), with permission of the author. The results are presented

according to both PSS 13-items and PSS-10. The short Portuguese 10-items version includes items 1, 2, 3, 6, 7, 8, 9, 10, 11 and 13, from the full scale Portuguese version (Ribeiro & Marques, 2009).

Each scale item regards a question about feelings and thoughts; respondents were asked to indicate how often they felt or thought during the last month, on a scale ranging from 0= never to 4= very often. An example item is “In the last month, how often have you been upset because of something that happened unexpectedly?” (Cohen, Kamarck *et al.*, 1983).

PSS scores are obtained by reversing the scores of the positive items (4, 5, 6, 7, 9, 10)., and then by summing across all items (Cohen, Kamarck *et al.*, 1983; Luft, Sanches *et al.*, 2007; Remor, 2006; Ribeiro & Marques, 2009; Trigo, Canudo *et al.*, 2010). See Table 35. Higher scores are related to higher stress (Ribeiro & Marques, 2009).

Table 35. Perceived Stress Scale (PSS)

Portuguese version			Scores
Perceived Stress Scale (PSS)	Full scale 13 items	Short scale 10 items	
Items	All	1, 2, 3, 6, 7, 8, 9, 10, 11, 13	
Positive items	4, 5, 6, 7, 9, 10	4, 5, 6, 7, 9, 10	To Reverse 0=4; 1=3; 2=2; 3=1; 4=0
Negative items	1, 2, 3, 8, 11, 12, 13	1, 2, 3, 8,	0=never; 1=almost never; 2=sometimes; 3=fairly often; 4=very often
			Some across all items

Musculoskeletal Questionnaire (MSQ)

Musculoskeletal disorder complaints were assessed using a 9 items musculoskeletal questionnaire (MSQ) developed by the author of this thesis, based on Standardized Nordic Musculoskeletal Questionnaire (SNMSQ) of Kuorinka *et al.* (1987), plus on the Portuguese version from Mesquita (2011) and on the adaptation done by Serranheira *et al.* (2003). For both Portuguese versions, permission was granted by their authors.

The Standardized Nordic Musculoskeletal Questionnaire is widely used (Descatha, Roquelaure *et al.*; Feng, Liang *et al.*, 2014; Hayes, Cockrell *et al.*, 2009; Palliser, Firth *et al.*, 2005; Pinheiro, Tróccoli *et al.*, 2002; Rafeemanesh, Jafari *et al.*, 2013; Ratzon & Mizrachi, 2008; Rodrigues & Pedro, 2013; Tanikonda & Koneru, 2014; Tezel, Kavrut *et al.*, 2005).

The Musculoskeletal Questionnaire (MSQ) was basically divided into 3 different parts, as long as they were 3 subscales. For the first subscale (MSQ1 to MSQ9) participants were asked if they had experienced those musculoskeletal complaints over the last week. An example item was “Have you had trouble (discomfort, pain, paraesthesia) at any time during the last 7 days in your neck?”. For the second subscale (MSQ1_1 to MSQ1_9) participants were asked if they had experienced those complaints over the last year, e.g., “Have you at any time during the last 12 months had trouble (discomfort, pain, paraesthesia) in your neck”.

Each subscale asked for sign and symptoms on 9 different regions of the body: 1 for neck; 2 for shoulders, 3 for elbows; 4 for wrists and hands; 5 for upper back; 6 for low back; 7 for Hips/and thighs; 8 for legs and knees; 9 for ankles and feet.

For each symptomatic region, participants were asked to point out the level of pain they reached when they experienced those complaints in a 1 to 5 scale, where “1= no pain” and “5= yes, with severe pain”.

Finally, on the third subscale (MSQ2_1 to MSQ2_9), participants were asked whether those complaints had impacted their ability to work, in a 1 to 5 scale, where 1=”no”; 2=”yes, up to 1 week”; 3=”yes, from 1 week to 1 month”; 4=”yes, more than one month but not everyday” and 5= “yes, everyday”. An example item is “Have you at any time during the last 12 months been prevented from doing you normal work because of the trouble (discomfort, pain, paraesthesia) in your neck?”

This Musculoskeletal Questionnaire (MSQ) applied on study2 has been developed for this thesis with the main purpose of maintaining the items within the limites of the present study, removing some question considered exhaustive or purposeless. It can be found on Appendix 3, as *“Questionário PSSLME”.*

Subjective Fluctuating Happiness Scale (SFHS)

SFHS is a measure of 10 items developed by Michaël Dambrun *et al.* (2012). This scale is introduced by one sentence in which the respondent is asked to read carefully each item and indicate in a 1-7 scale of how much does he/she agree or disagree with the sentence. Choosing 1, means strongly disagree; choosing 7, means strongly agree. For fluctuating happiness, scores range from 1.0 to 7.0. Higher score is related to higher fluctuating happiness

(Dambrun, Ricard *et al.*, 2012). The validation of this scale for Portuguese people constitutes the Study 1, developed on Chapter II of this thesis.

Subjective Authentic-Durable Happiness Scale (SA-DHS)

Subjective Authentic-Durable Happiness Scale (SA-DHS), was developed by Michaël Dambrun *et al.* (2012). This scale (SA-DHS) consists of 16 items. From this 16 items, 13 are positive and the other three (items 8, 13 and 16) are negatively valenced to assess durable unhappiness. These unhappiness items do not include the score for happiness; they are fillers, included in the measure in order to control compliance bias (Dambrun, Ricard *et al.*, 2012).

In order to introduce SA-DHS, there is a sentence asking respondents to indicate, in a 1-7 scale, which is their regular level for each of those 16 items. The scale ranges from 1= very low to 7= very high. The mean score for authentic-durable happiness is the average of the 13 positive items ranging from 1.0 to 7.0; higher scores reflect greater authentic-durable happiness. Two sub-scores can be calculated: contentment and inner peace. According to the authors of the original scale items 1, 2, 3, 4, 6, 9, 11 and 12 loads on contentment sub-scale; and items 5, 7, 10, 14 and 15 loads on inner peace subscale. However, in the Portuguese study the factor analysis loaded item 15 on contentment sub-scale. So, consequently and according to the authors of the Portuguese scale, items 1, 2, 3, 4, 6, 9, 11, 12 and 15 loads on

contentment sub-scale; and items 5, 7, 10 and 14 loads on inner peace subscale. For more details, see Chapter II, and Table 30.

Colection of data

Portuguese dentists were surveyed online by SurveyMonkeys Inc (Link: **https://pt.surveymonkey.com/s/felicidadesmedicosdentistas**), in a convenient sample, with the cooperation of Sociedade Portuguesa de Estomatologia e Medicina Dentária (SPEMD).

Questionnaires were sent by mail to different dentists all over the country, inviting them to participate. All dentists were informed about the confidentiality of their answer, and the posterior anonymous nature of data analysis.

The first page of the questionnaire was dedicated to collect demographic data (Appendix 3).

Description of variables

Even though the present study is not experimental, independent and dependent variables were identified based on the hypothesis and the nature of the variables (independent not influenced by researchers).

Dependent variables

Dependent variables were: stress, symptoms/complaints of musculoskeletal disorder, subjective fluctuating happiness and subjective authentic-durable happiness.

For more details see Table 36, Description of dependent variables

Table 36. Study2, Dependent Variables

Dependent Variables	
Stress	Perceived Stress Scale (PSS) *
Symptoms/complaints of musculoskeletal disorder	Musculoskeletal Questionnaire **
Subjective fluctuating happiness	Subjective Fluctuating Happiness Scale (SFHS) ***
Subjective authentic-durable happiness	Subjective Authentic-Durable Happiness Scale (SA-DHS) ****

*, **, ***, ****For more details see Appendix 3

Independent variables

Independent variables were: socio-demographics variables; variables related to job - habits and attitudes, to the practice of sports, to religiosity and religious involvement; variables related with auto evaluation of health and stress - professional, familiar and of the overall stress. For more details on description of variables see Table 36, Table 37 and Table 38.

Table 37. Study2, Independent Variables

Independent Variables	
Socio-demographics	Gender; age; profession; academic degree;
Job - habits and attitudes	Working place; year of practice of dentistry; area of practice; number of hours practicing a week; not working anymore in a specific area of dentistry, because of some health problem; have another job, besides dentistry; teach dentistry; presence and number of pauses between patients
Practice of sports	The habit of practicing sports; the frequency of sport activity; the habit of practice yoga or meditation; the

	frequency of practice yoga or meditation
Religiosity and religious involvement	To follow a religion or a spiritual thought: religious involvement

Table 38. Independent variables related to self-assessment of health

Independent variables, self-assessment health	
Auto evaluation of health	
Auto evaluation of stress -professional, familiar and of the overall stress	Self assessment of professional stress; familiar stress and of the overall stress

Data processing

All data collected was statistically analyzed with the software for statistical analysis -Statistical Package for the Social Sciences, SPSS version 21.

Prior to running the statistical analyses to test the hypotheses, all measures were factor analyzed to ensure that the dimensionality of the measures was consistent with the previous literature.

Reliability analyses, specifically Cronbach's alpha, were computed for each measure. The terms independent variable and predictor variable were used interchangeably as well as dependent variable and criterion variable. Means, standard deviations, and bivariate correlations were computed and reported for all scales. Categorical variables (e.g., gender) were dummy coded for subsequent analyses.

Power Analysis Estimates for Hypotheses

The four hypotheses compare Portuguese dentists with the Portuguese general population on a variety of measures. Independent sample T-tests were performed to test these four hypotheses. The independent variable had two levels (Portuguese dentists vs. Portuguese general population) and the dependent variables were stress, musculoskeletal disorder complaints, authentic happiness and fluctuating happiness.

Since there was one independent variable and 5 outcome variables, (authentic-durable happiness is comprised of two dimensions), it was expected to have 10 cells. The simplest rule of thumb regarding number of participants, for instance in MANOVA or T-test, would be to have more cases than dependent variables in each cell (Tabachnick & Fidell, 2006). To test these hypotheses, a minimum of 60 subjects was needed according to this

rule of thumb. Guilford and Frunchter (1978) presented a table with various sample size estimates (Guilford & Frunchter, 1978). According to the table, for a moderate effect size with alpha at .05 and power at .80, 60 subjects were needed. Finally VanVoorhis and Morgan (2007) presented various rules of thumb for different statistical procedures and recommended Cohen's (1988) suggestion that given a medium to large effect size, 30 participants per cell should lead to about 80% power (Vanvoorhis & Morgan, 2007). This recommendation results in an estimated sample size of 300, significantly different from the other two recommendations. Table 39, summarizes the sample size estimated based on three different rules of thumb (ROT).

Table 39. Sample size estimation

Hypotheses	Number of predictors	ROT 1	ROT 2	ROT 3
H1-4	5	60	60	300

ROT 1= (Tabachnick & Fidell, 2006)

ROT 2= (Guilford & Frunchter, 1978)

ROT 3= (Vanvoorhis & Morgan, 2007)

RESULTS

Descriptive statistic

Sample Characterization

Study 2 had a total of 525 respondents. From this total number, 17 cases were removed, since they only had answered to no more than the 5 introductory questions.

Final sample was 508 respondents (n= 508): 308 were women and 200 were men.

Gender

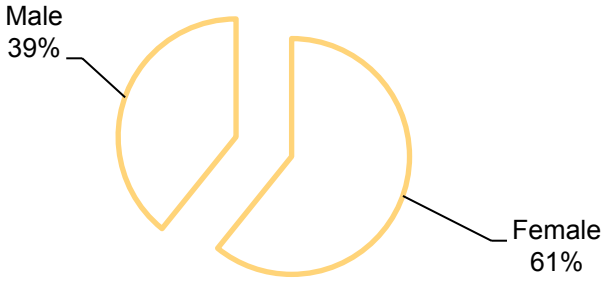


Figure 33. Study2, Gender

Age

Table 40. Study 2, Age

Variables	Results
Age	Mean= 34.00 years; SD= 10.68; minimum age= 21 years old; maximum age= 75 years old

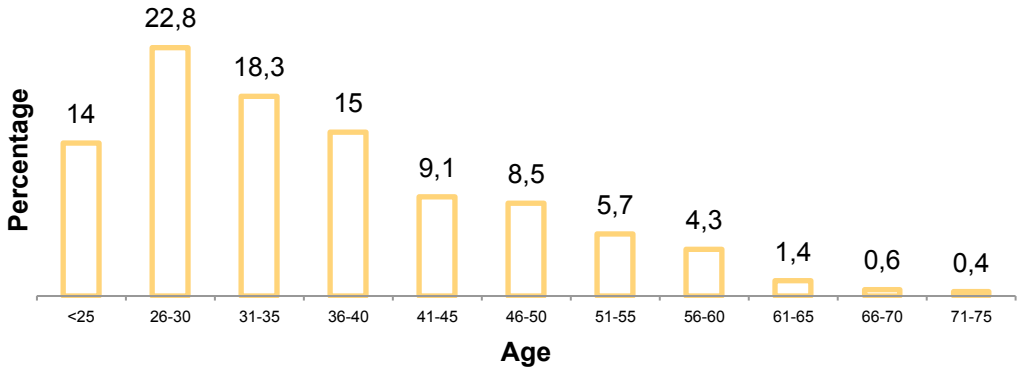


Figure 34. Study2, Age

Professional title

97% of respondents were Dentists; 2.2% were Stomatologists and .8% were both Dentists and Stomatologists.

Academic degree and year of graduation

Table 41. Study 2, Academic characteristics

Variables	Results
Academic degree	37.4%=integrated master; 34.6 %=graduated; 18.1%=master degree, beside graduation; 7.9%= PhD; 2.0%=post-doc.
Year of graduation	Before 2000 =36,6%; from 2000 till 2010 =39,4%; since 2011 =24.0%

Academic degree

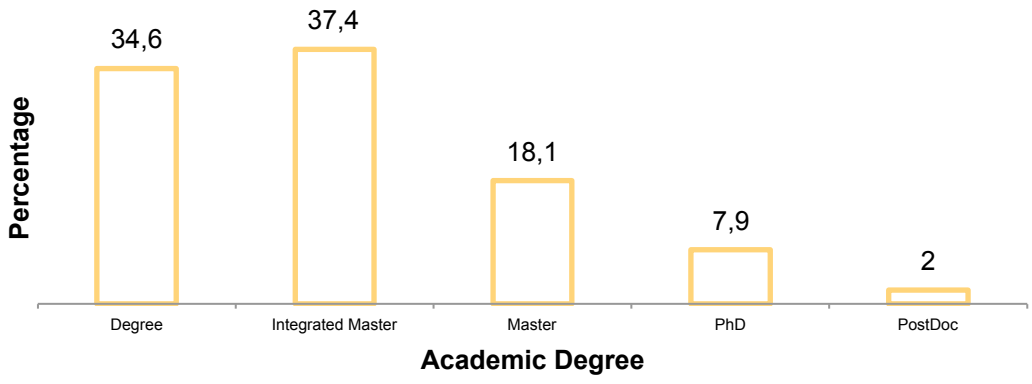


Figure 35. Academic degree

Characteristics of the workiplace

Table 42. Study 2, Working place characteristics

Variables	Results
Working place characteristics	57.0%=other's clinic; 23.4%=own clinic; 16.4%=own clinic and other's clinic; 3.2%=a non listed place
Number of colleagues	44.6%=more than three colleagues; 19.0%=two; 15.6%=one; 12.7% three; and 8.1% no more dentists but them.

Place of practice

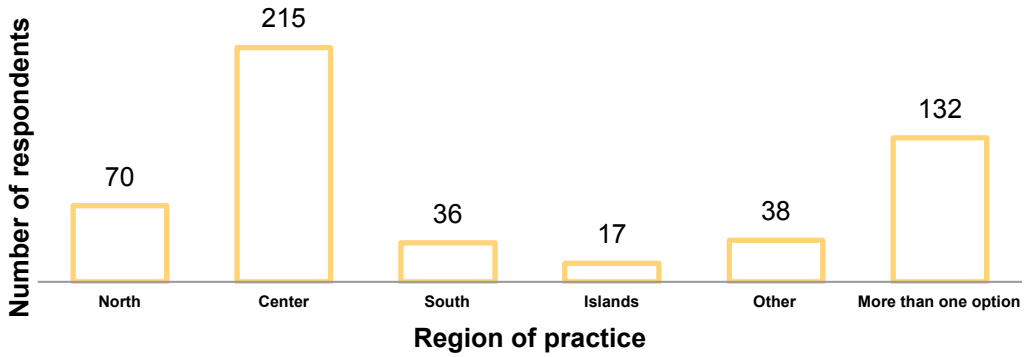


Figure 36. Region of practice

42.3% of respondents practiced in the center of Portugal mainland; 26.0% worked simoultaneously in more than one of the listed regions; 13.8% in the north; 7.5% in a non mentioned region; 7.1% in the south of Portugal mainland; and 3.3% of respondents practiced in the Portuguese Islands “Açores” and “Madeira”.

Weakly workload on Dentistry

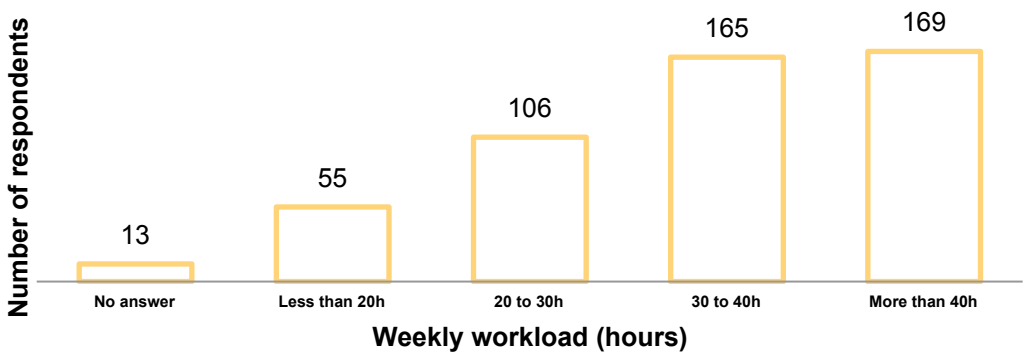


Figure 37. Weekly workload, number of hours

34.1% of respondents used to work on Dentistry, more than 40 hours a week; 33.3% from 30 to 40 hours; 21,4% from 20 to 30 hours; and 11.1% less than 20 hours a week.

Area of clinical practice

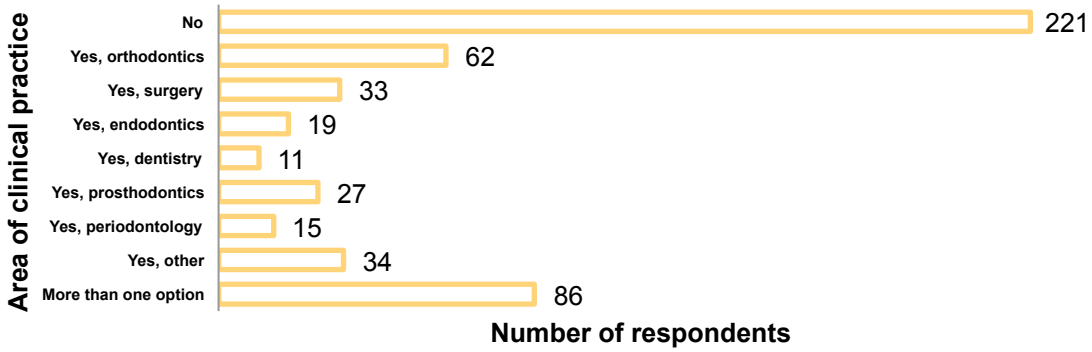


Figure 38. Area of clinical practice

40.6% were general dentists; 16.9% worked simultaneously in more than one of listed areas; 12.2% were orthodontists; 6.7% worked in a specific, but not listed area; 6.5% dental surgeons; 5.3% prosthodontists; 3.7% endodontics; 3.0% periodontists; 2.2% used to work mainly in restorative dentistry.

Health related problems, Stop practice

4.0% of respondents mentioned they did not work anymore, in a specific area in dentistry, because of a health related problem.

Among them, 68.4% pointed musculoskeletal disease, as the cause for having stop working on dentistry; 21.1% pointed stress; and 10.5% some other not mentioned reason as being responsible for them not to work.

Reason why stop practice

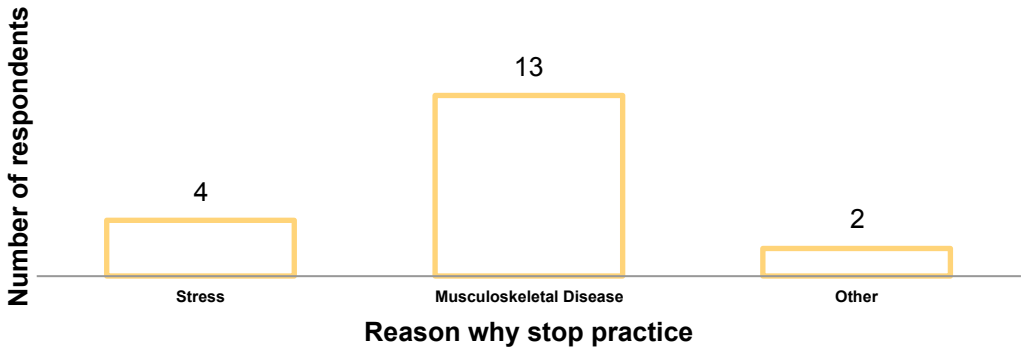


Figure 39. Reason why stop practice

Habits and attitudes

Table 43. Habits and Attitudes

Practice sport activities	56.6% =yes; 43.4% =no If yes: 40.6% did it twice a week; 22.7%=3 times a week; 21.6% once a week; 15.1%=more than 3 times a week. 91.4% =not practice yoga/meditation; 8.6% =yes
Religion	60.7%=no involvement; 39.3%=yes

Pauses

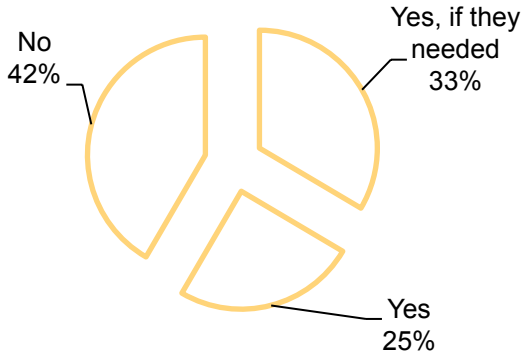


Figure 40. Pauses

In case of having pauses 55.4% of respondents reported they last for 5-10 minutes; 30.3% less than 5 minutes; 14.3% for more than 10 minutes.

Motive

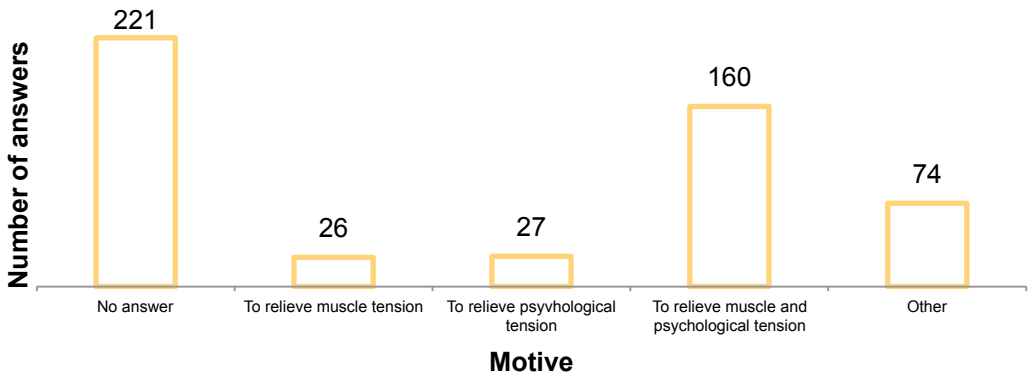


Figure 41. Motive of pauses

The motive for having pauses were the following: 55.7% to relieve muscle and psychological tension; 9.4% to relieve psychological tension; 9.1% to relieve muscle tension and 25.8% for another purpose.

Auto-evaluation on Health

Blood Pressure

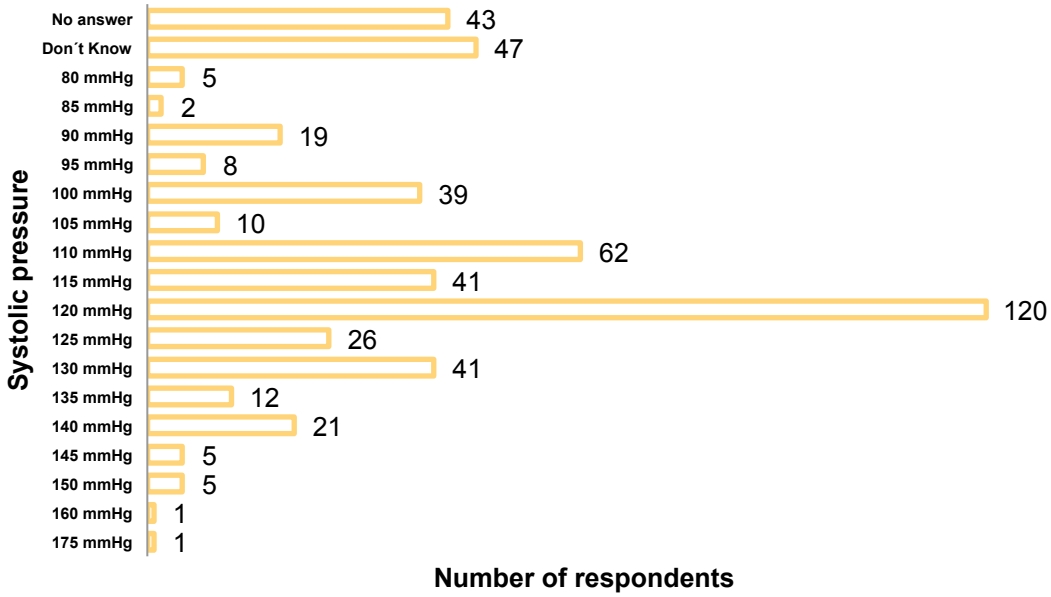


Figure 42. Systolic pressure

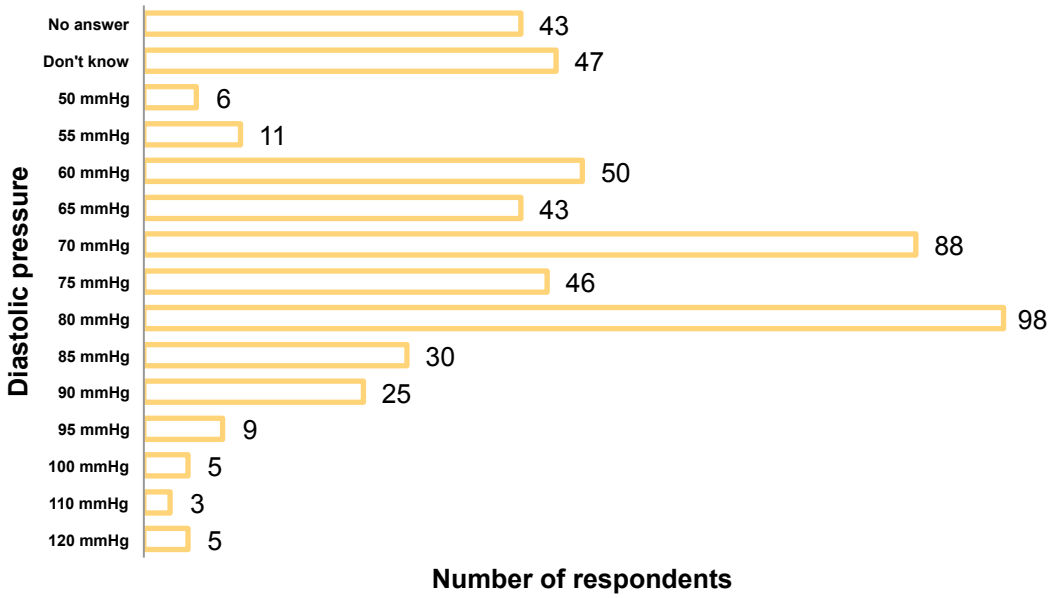


Figure 43. Diastolic pressure

Blood pressure: 91.6% did not have high blood pressure; 5.4% had high blood pressure: 3.0%= did not know

Medication for blood pressure - Yes: 5.4% took; No= 94.6%

Health condition

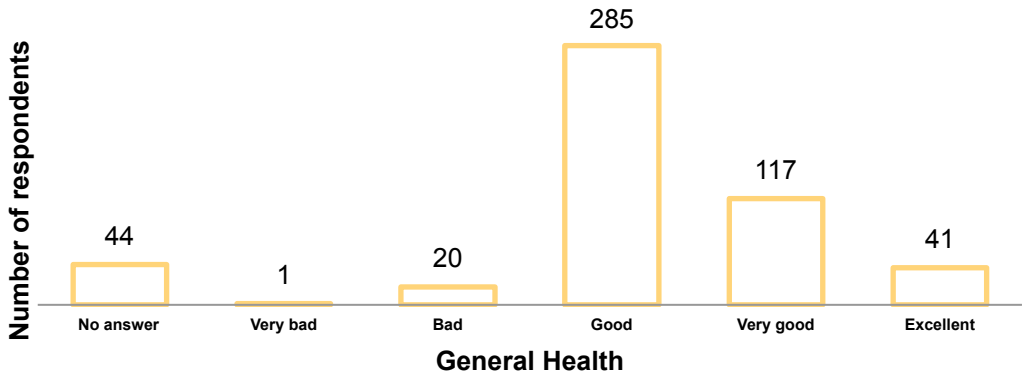


Figure 44. Auto-evaluation on general health

61.4% of respondents rated their health as being good; 25.2% as being very good; 8.8% as excellent; 4,3% as bad and 0.2% as very bad.

Auto-evaluation on Stress

Professional Stress

Figure 45. Professional stress

45.9% of respondents reported having professional stress sometimes present in their lives; 35.1% almost always present; 11.6% ranged their professional stress as excessive; 7.3% of respondents, as rarely present. No one self-evaluated his or her professional stress as inexistent.

Familiar Stress

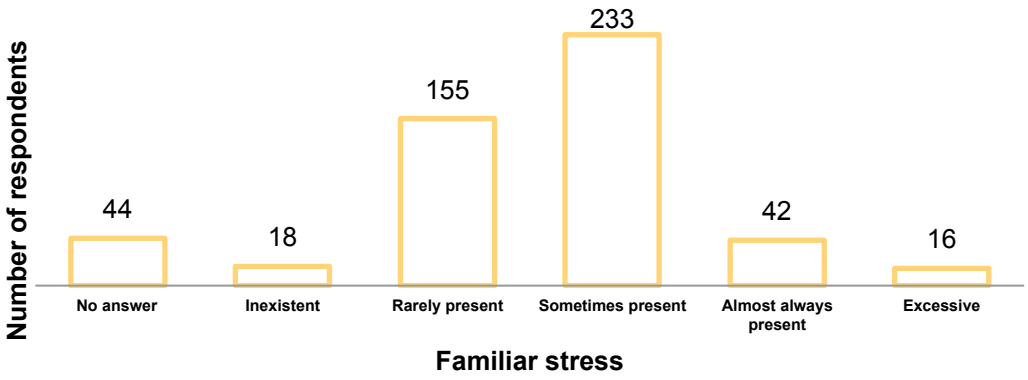


Figure 46. Familiar stress

50.2% of respondents ranged familiar stress as sometimes present in their life; 33.4% as rarely present; 9.1% of respondents reported familiar stress almost always present; 3.9 as inexistent and 3.4% ranged as excessive the familiar stress they had in their life.

Overall stress

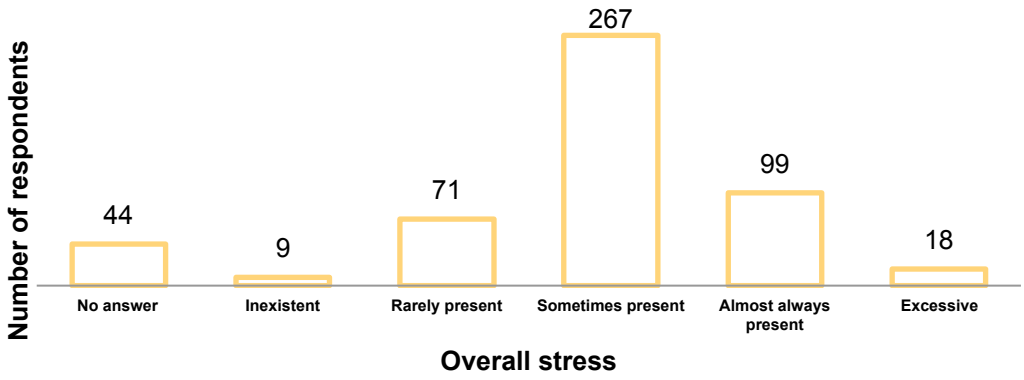


Figure 47. Overall stress

57.5%= sometimes present in their lives; 21.3%= almost always present; 15.3% rarely present; 3.9% excessive; 1.9% =nonexistent.

Reliability Analysis

All scales

Table 44. Reliability statistic, for all scales

		Number of Items	Cronbach's Alpha
PSS		10	.78
		13	.80
MSQ	Full scale	27	.88
	7 days	9	.78
	12 months	9	.78
	Miss work	9	.76
SFHS		10	.98
SA-DHS	Full scale	13	.94
	Contentment	9	.93
	Inner Peace	4	.91

Perceived Stress

Table 45. Perceived Stress

PSS	Mean	Std. Deviation	Cronbach's Alpha	N of Items
Full scale	23.00	6.13	.80	13
Short scale	17.62	5.49	.78	10

Mean value for perceived stress was 23.00, on full scale, and 17.62 on short scale. Cronbach's Alpha for Perceived Stress Scale was .80 for full scale and .78 for short scale.

Musculoskeletal Complaints

Table 46. Scale Statistics MSQ

Scale/subscale	Cronbach's Alpha	Mean, Pain intensity	Std. Deviation
Full scale	.88	1.42	.36
Last 7 days (9 items)	.78	1.53	.49
Last 12 month (9 items)	.78	1.67	.54
Miss job (9 items)	.76	1.05	.19

Cronbach's Alpha for Musculoskeletal Questionnaire was .88 for all items; was .78 for last days subscale, 9 items; and .78 for last 12 months subscale, 9 items. Miss job during the last 12 months subscale, 9 items, had a Cronbach's Alpha of .76.

The mean value for the intensity of musculoskeletal complaints (all items) was, in a 1 to 5 scale: 1.42 (SD= .36).

The mean value of the intensity for musculoskeletal pain (9 items) was 1.53 (SD= .49), for last 7 days and 1.67 (SD= .54), for last 12 months respectively, in a 1 to 5 scale.

In both mentioned above subscales, the number "1" corresponds to "no pain" and the number "5" to "yes, very severe pain".

The mean value for the impact MS complaints had in their ability to work (9 items) was 1.05 (SD= .19). In this subscale, the number "1" corresponds to "no impact" and the number "5" to a everyday impact on the ability to work.

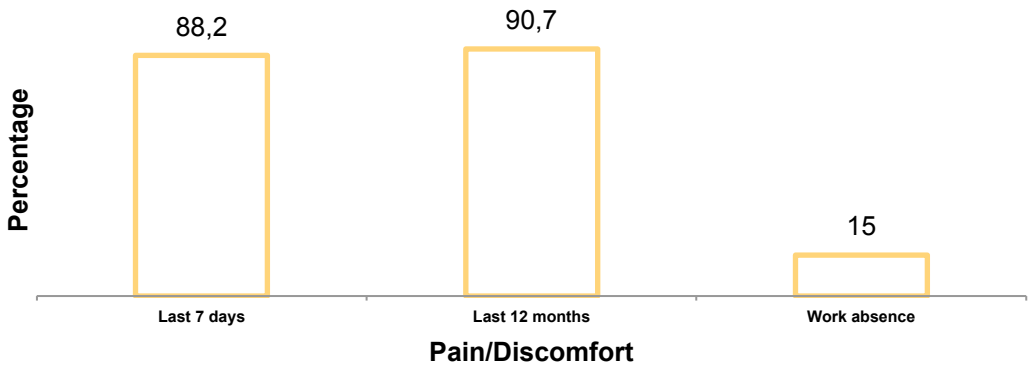


Figure 48. Presence of MD Pain/Discomfort

Descriptive statistic for Musculoskeletal Complaints

Musculoskeletal Complaints last 7 days

The percentage of dentists reporting musculoskeletal complaints such as discomfort, pain or paraesthesia on the last 7 days is described on Table 47.

Table 47. MSC, last 7 days

	Symptoms/ Complaints last 7 days
Neck	56.4%
Shoulders	53.4%
Elbows	9.1%
Wrists/Hands	37.7%
Upper back	40.9%
Low back	54.9%
Hips/thighs	17.2%
Knees	27.3%
Ankles/feet	15.3%

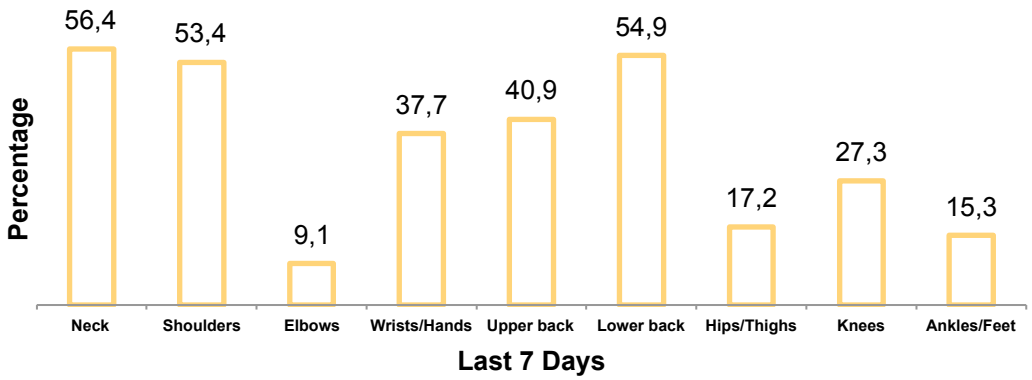


Figure 49. MSD values last 7 days

Musculoskeletal Symptoms and Complaints last 12 months

The percentage of dentists responding reported discomfort, pain or paraesthesia on the last 12 months is described on Table 48.

Table 48. MSC, last 12 months

	Symptoms / Complaints last 12 months
Neck	69.2%
Shoulders	58.6%
Elbows	12.2%
Wrists/Hands	46.4%
Upper back	48.4%
Low back	64.3%
Hips/thighs	18.9%
Knees	31.0%
Ankles/feet	18.4%

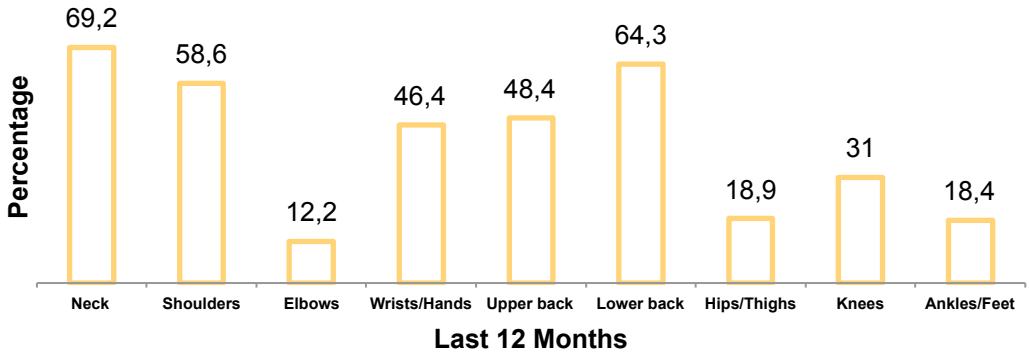


Figure 50. MSD values last 12 months

Missing work last 12 months

The percentage of dentists reporting how their musculoskeletal complaints (discomfort, pain or paraesthesia) had impacted their ability to work over the last 12 months is described on Table 49.

Table 49. Missing work last 12 months

	Missing work last 12 months
Neck	7.8%
Shoulders	4.0%
Elbows	1.3%
Wrists/Hands	4.5%
Upper back	3.0%
Low back	6.5%
Hips/thighs	1.3%
Knees	2.3%
Ankles/feet	1.5%

Figure 51. Work absence related to MSD

Happiness

Fluctuating happiness

Table 50. Scale Statistics, SFHS

N of Items	Cronbach's Alpha	Mean	Std. Deviation
10	.89	3.32	1.21

Mean score for Subjective Fluctuating Happiness Scale (SFHS) was 3.32 (SD= 1.21); Cronbach's alpha was .89.

Authentic-durable happiness

Table 51. Scale Statistics. SA-DH

	Cronbach's Alpha	Mean	Std. Deviation
Full happiness scale (13 items)	.94	4.54	.98
Contentment subscale (9 items)	.93	4.44	1.02
Inner Peace subscale (4 items)	.91	4.75	1.17

Cronbach's alpha was .94 for Subjective Authentic-Durable Happiness Scale (SA-DHS), all 13 items; and .93 and .91 for subscales of contentment and inner peace, respectively.

Mean for full scale, 13 items, was 4.54 (SD= .98). Mean value was 4.44 (SD= 1.02) for contentment and 4.75 (SD= 1.17) for inner peace subscales.

Results for Hypothesis

Result for hypothesis 1

In order to test hypothesis 1, two independent sample t-tests were used comparing the mean values for stress in the dentist sample with the mean values for the Portuguese general population both for full (Ribeiro & Marques, 2009) and short scales of perceived stress (Trigo, Canudo *et al.*, 2010). For details see Table 52 and Table 53.

Results with full scale

Table 52. T-test PSS, full scale

	Full Scale – 13 items	
	Dentists	(Ribeiro & Marques, 2009)
	Total	Total
N	407	45
Mean	22.99	19.96
Std. deviation	6.12	7.75

T-test	t (406)= 9.97; p= .00
T-test for gender	t (397)= 1.73 p= .08

There is a significant difference (t (406)= 9.97; p= .00) between stress levels of Portuguese dentists (mean= 22.99) and Portuguese population (mean= 19.96) with Portuguese dentists presenting higher stress level than general Portuguese population, on the full scale of Perceived Stress (Ribeiro & Marques, 2009).

Results with short scale

Table 53. T-test PSS, short scale

	Short Scale – 10 items					
	Dentists			(Trigo, Canudo *et al.*, 2010)		
	F	M	Total	F	M	Total
N	242	157		450	295	745
Mean	18.14	16.89	17.62	16.6	13.4	15.33
Std. deviation	5.61	5.32	5.49	6.3	6.5	

T-test	t (406)= 8.40; p= .00
T-test for gender	t (397)= 2.21; p= .03

There was a significant difference (t (406)= 8.40; p= .00) between stress levels of Portuguese dentists (mean= 17.62) and the Portuguese population (mean= 15.33), with Portuguese dentists presenting higher stress level than general Portuguese people, for short versions of PSS (Trigo, Canudo *et al.*, 2010). Table 53.

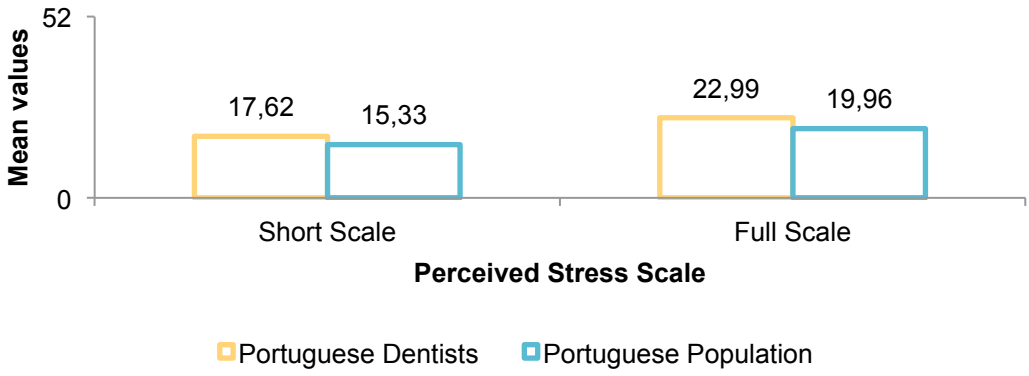


Figure 52. Comparing Perceived Stress, Dentist / Portuguese population

Results for Hypothesis 2

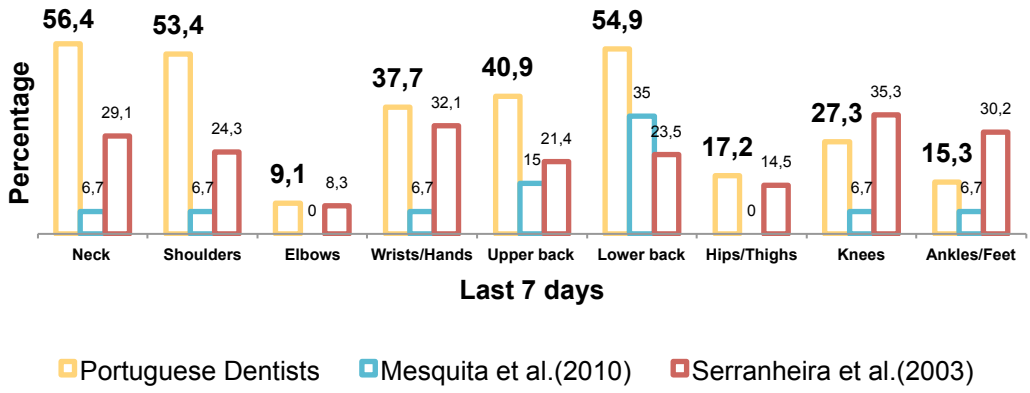


Figure 53. Comparing MSS, Dentists/ Portuguese population

In order to test hypothesis 2 it was initially planned to be used One-Sample t-tests comparing the mean value for the prevalence of symptoms of musculoskeletal disorders in the dentist sample with the mean value for the prevalence of symptoms of musculoskeletal disorders on the Portuguese general population.

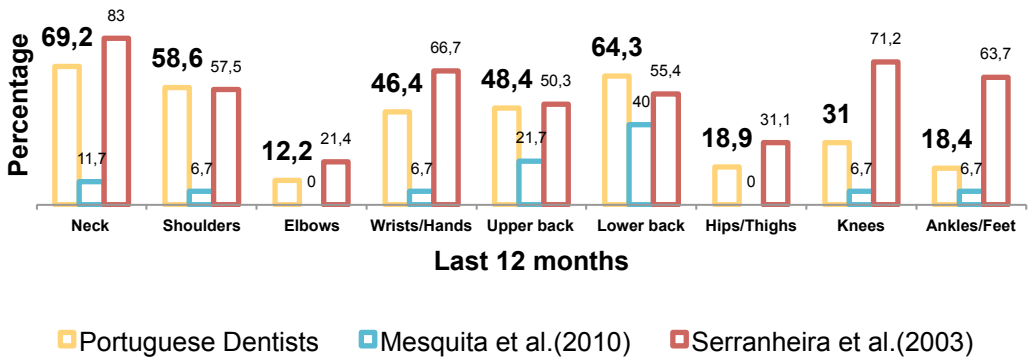


Figure 54. Comparing MSD (last 12 months) Dentist / Portuguese population

Nevertheless, the results in this area are given as percentages. So, the answer to the hypothesis 2 will be presented by comparing in percentage the results of this research with those already existing.

There is significant difference in regard to the complaints of musculoskeletal disorders between Portuguese dentists and the Portuguese general population, with dentists presenting higher percentage of complaints (72,4%) than the general Portuguese population (39%) for spine (Sousa, 2012).

Results for Hypotheses 3 and 4

In order to test hypothesis 3, independent samples t-tests were also conducted comparing the dentist sample (Mean= 3.32; SD= 1.21) and the sample collected for the validation study (Mean= 3.58; SD= 1.20). For subjective fluctuating happiness, there were statistically significant differences

between the dentist sample and the general Portuguese sample (t (2611)= -4.06, p< .01). Dentists reported lower levels of subjective fluctuating happiness.

In order to test hypothesis 4, independent samples t-tests were conducted comparing the prevalence of authentic-durable happiness on dentist sample (Mean=4.54; SD= .99) and on sample collected for the validation study (Mean=4.60; SD= 1.00).

There was no statistically significant difference (t (2559)= -1.18; p= .24) on the prevalence of authentic-durable happiness between Portuguese dentists and the Portuguese general population. Plus, there were no significant differences between dentists and the general Portuguese population on either the contentment dimension (t (2556)= -1.20, ns) or the inner peace dimension (t (2555)= -.89, ns).

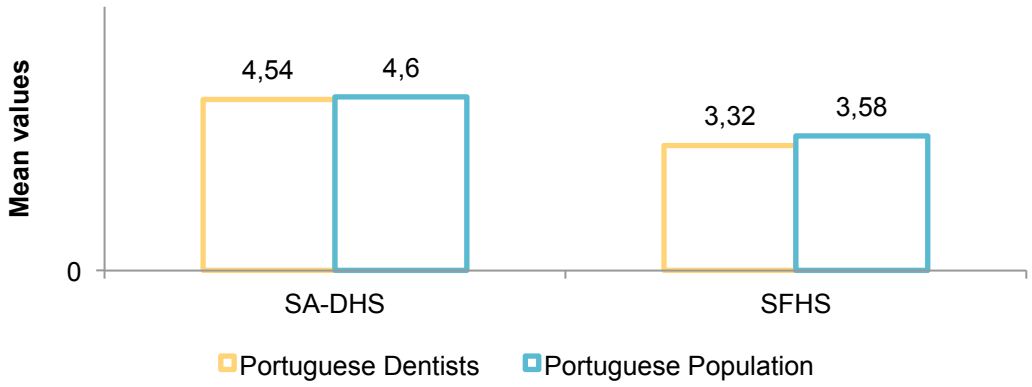


Figure 55. Comparing subjective happiness between dentists and Portuguese general population

CHAPTER IV
RELATIONSHIP BETWEEN HAPPINESS, STRESS AND MUSCULOSKELETAL DISORDERS IN PORTUGUESE DENTISTS, STUDY3

OBJECTIVES AND HYPOTHESES

The purpose of this study was to evaluate the relationship between happiness, stress and musculoskeletal disorders in Portuguese dentists.

The following hypotheses were formulated:

$H_{1.}0$. Stress level in Portuguese dentists is not predicted by the prevalence of musculoskeletal disorders complaints

$H_{1.}1$. Stress level in Portuguese dentists predicts the prevalence of musculoskeletal disorders complaints

$H_{2.}0$. Stress level in Portuguese dentists is not predicted by the prevalence of authentic-durable happiness

$H_{2.}1$. Stress level in Portuguese dentists predicts the prevalence of authentic-durable happiness

$H_{3.}0$. Stress level in Portuguese dentists is not predicted by the prevalence of fluctuating happiness

$H_{3.}1$. Stress level in Portuguese dentists predicts the prevalence of fluctuating happiness

$H_{4.}0$. Stress level among dentists is not predicted by their age

$H_{4.}1$. Stress level among dentists predicts their age

$H_{5.}0$. Stress level among dentists has no statistical differences between gender

$H_{5.}1$. Stress level among dentists has statistical differences between gender

$H_{6.}0$. Stress level among dentists is not predicted by the practice of sport activities and yoga /meditation

$H_{6.}1$. Stress level among dentists predicts the practice of sport activities and yoga /meditation

$H_{7.}0$. Stress levels among dentists is not predicted by years of practicing Dentistry

$H_{7.}1$. Stress levels among dentists predicts years of practicing Dentistry

$H_{8.}0$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists is not predicted by the prevalence of authentic-durable happiness

$H_{8.}1$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists predicts the prevalence of authentic-durable happiness

$H_{9.}0$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists is not predicted by the prevalence of fluctuating happiness

$H_{9.}1$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists predicts the prevalence of fluctuating happiness

$H_{10.}0$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists is not predicted by their age

$H_{10.}1$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists predicts their age

$H_{11.}0$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists has no significant differences between genders

$H_{11.}1$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists has significant differences between genders

$H_{12.}0$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists is not predicted by the practice of sport activities and yoga/meditation

$H_{12.}1$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists predicts the practice of sport activities and yoga/meditation

$H_{13.}0$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists is not predicted by years of practicing Dentistry

$H_{13.}1$. The prevalence of musculoskeletal disorders complaints among Portuguese dentists predicts years of practicing Dentistry

$H_{14.}0$. The prevalence of authentic-durable happiness among Portuguese dentists is not predicted by their age

$H_{14.}1$. The prevalence of authentic-durable happiness among Portuguese dentists predicts their age

$H_{15.}0$. The prevalence of authentic-durable happiness among Portuguese dentists is not predicted by gender

$H_{15.}1$. The prevalence of authentic-durable happiness among Portuguese dentists predicts differences between gender

$H_{16.}0$. The prevalence of authentic-durable happiness among Portuguese dentists is not predicted by their religious involvement

$H_{16.}1$. The prevalence of authentic-durable happiness among Portuguese dentists predicts their religious involvement

$H_{17.}0$. The prevalence of authentic-durable happiness among Portuguese dentists is not predicted by the practice of sport activities and yoga /meditation

$H_{17.}1$. The prevalence of authentic-durable happiness among Portuguese dentists predicts the practice of sport activities and yoga /meditation

$H_{18.}0$. The prevalence of fluctuating happiness among Portuguese dentists is not predicted by their age

$H_{18.}1$. The prevalence of fluctuating happiness among Portuguese dentists predicts their age

$H_{19.}0$. The prevalence of fluctuating happiness among Portuguese dentists is not predicted by their gender

$H_{19.}1$. The prevalence of fluctuating happiness among Portuguese dentists predicts their gender

$H_{20.}0$. The prevalence of fluctuating happiness among Portuguese dentists is not predicted by their religious involvement

$H_{20.}1$. The prevalence of fluctuating happiness among Portuguese predicts their religious involvement

$H_{21.}0$. The prevalence of fluctuating happiness among Portuguese dentists is not predicted by the practice of sport activities and yoga /meditation

$H_{21.}1$. The prevalence of fluctuating happiness among Portuguese dentists predicts the practice of sport activities and yoga /meditation

TYPE OF STUDY

This is an observational cross-sectional survey type of study.

METHODOLOGY

Data has been previously collected for Study2, “Stress, Symptoms of Musculoskeletal Disorders, and Happiness in Portuguese Dentists”, presented in Chapter III of this thesis.

Prior to running the statistical analyses to test the hypotheses, all measures were factor analyzed to ensure that the dimensionality of the measures was consistent with previous literature.

The terms independent variable and predictor variable were used interchangeably as well as dependent variable and criterion variable.

Reliability analyses, specifically Cronbach’s alpha, were computed for each measure. Means, standard deviations, and bivariate correlations were computed and reported for all scales. Categorical variables (e.g., gender) were dummy coded for subsequent analyses.

All statistical details related to happiness, stress amd musculoskeletal measures and individual results have been developed and presented along

the chapter III. Detailed information about the happiness scales are presented on Chapter II, Validation of Subjective Happiness Scales.

All data was statistically analyzed with the software "Statistical Package for the Social Sciences, SPSS version 21".

There were 21 hypotheses. However, to reduce the likelihood of family wise type I error, five statistical analyses were conducted to test all 21 hypotheses.

Power Analysis

Power Estimates for Hypotheses 1-21

The hypotheses H1-H21 were tested with a series of multiple regression analyses. A detailed description of the analyses is provided in "Methodology" section. The required sample size depends on desired power, alpha level, number of predictors, and expected effect sizes. Tabachnick and Fidell (2006) provide several rules of thumb (Tabachnick & Fidell, 2006). For instance one popular computation is $N \geq 50 + 8m$ (where m is the number of independent variables) for testing multiple correlation and $N \geq 104 + m$ for testing individual predictors. These computations assume a medium-size relationship. Tabachnick and Fidell (2006) stated that one's interest in both the overall correlation and the individual predictors, one would calculate the sample size both ways and choose the largest number of cases. Stevens (1996) recommends 15 cases for each predictor (Stevens, 1996). The hypotheses were tested in groupings and the Table 54 lists the hypotheses,

the number of predictors to test the set of hypotheses and the estimated sample sizes using the three rules of thumb noted above.

Table 54. Sample Size Estimates Based on Three Rules of Thumb (ROT)

Hypotheses	Number of predictors	ROT #1 50 + 8m	ROT #2 104 + m	ROT #3 15m
H1-7	9	122	113	135
H8-13	7	106	111	105
H14-17	5	90	109	75
H18-21	5	90	109	75

Note: m = number of predictors

Hypotheses 1 to 7

Hypotheses 1 to 7 examine various factors in relation to stress among the sample of Portuguese dentists. A multiple linear regression analysis was computed to test these hypotheses. The independent or predictor variables were: musculoskeletal disorder complaints, authentic-durable happiness, fluctuating happiness, age, gender, sports activities, and years of practicing dentistry. The dependent or criterion variable was stress.

Hypotheses 8 to 13

Multiple linear regression was conducted to test hypotheses 8-13 among the sample of Portuguese dentists. The independent or predictor variables were: authentic-durable happiness, fluctuating happiness, age, gender, sports activities, and years of practicing dentistry. The dependent or criterion variable were the number of musculoskeletal disorder complaints.

Hypotheses 14 to 17

To test hypotheses 14 to 17, multiple linear regression analysis was performed. The predictor variables were: age, gender, religious involvement and practice of sports activities. The criterion variable was authentic-durable happiness.

Hypotheses 18 to 21

The final analysis, to test hypotheses 18 to 21, was also a multiple linear regression analysis. The sample for this analysis was the Portuguese dentists. The predictor variables were age, gender, religious involvement and the practice of sports activities. The criterion variable is fluctuating happiness.

RESULTS

Results are organized as follow:

- I. Reliability Analysis
- II. Multiple regressions
    1. Model predicting Perceived Stress, Hypotheses 1 to 7
    2. Model predicting Musculoskeletal Complaints, Hypotheses 8 to 13
    3. Model predicting Authentic-Durable Happiness, Hypotheses 14 to 17
    4. Model predicting Fluctuating Happiness, Hypotheses 18 to 21
- III. Direct answers to individual Hypotheses

I. Reliability Analysis

Reliability analysis, specifically Cronbach's alpha are detailed in Table 55.

Table 55. Reliability analysis

Reliability Analysis	Items	N	Cronbach's alpha
PSS, short-scale	10	407	.78
PSS, full-scale	13	407	.80
SA-DHS, full scale	13	425	.94
SA-DHS, Contentement	9	425	.93
SADHS, Inner Peace	4	425	.91
SFHS	10	447	.89
MSQ, 7 days	9	406	.78
MSQ, 12 months	9	403	.78
MSQ, work absence	9	399	.76

Mean, standard deviations, median, maximum and minimum values for each of all scales are represented in Table 56.

Table 56. Statistics

		N	Mean	SD	Median	Min	Max
PSS	short-scale	407	17.62	5.53	17.00	3.00	34.00
	full-scale	407	22.98	6.16	23.00	5.00	42.00
SA-DHS	full scale	425	4.54	.98	4.69	1.38	6.92
	Contentement	425	4.44	1.02	5.56	1.33	6.89
	Inner Peace	425	4.75	1.17	5.00	1.00	7.00
SFHS		447	3.32	1.21	3.10	1.00	7.00
MSQ	7 days	406	1.53	.49	1.44	1.00	4.11
	12 months	403	1.67	.54	1.56	1.00	4.56
	Miss work	399	1.05	.19	1.05	1.00	2.78

II. Multiple regressions

II. 1. Hypotheses 1 to 7

Multiple regression model predicting perceived stress

Multiple regression was used to test hypotheses 1 to 7. Since there are three variations to the questions regarding musculoskeletal complaints and since these measures are significantly inter-correlated, three regression models were computed to test predictors of perceived stress. The results of the analyses are presented in Table 57**,** Table 58 and Table 59.

Weekly scale of musculoskeletal complaints

As shown in Table 57, with the weekly version of musculoskeletal complaints, the model was statistically significant (F= 40.21**, p< .01) and the variables in the model account for 48% of the variability in perceived stress. When looking at the standardized Beta coefficients, there were four significant predictors. Dentists who reported experiencing musculoskeletal complaints within the last week had higher levels of perceived stress (β = .09**, p< .01). Dentists who reported contentment and inner peace had lower levels of

perceived stress (β = -.39** and -.18**, p< .01), respectively. Finally dentists who reported higher levels of subjective fluctuating happiness were more likely to report perceived stress (β = .15**, p< .01). The other predictors (e.g., age, gender) were not statistically significant.

Multiple Regression Model Predicting Perceived Stress (with Musculoskeletal Complaints within the last Week as a predictor)

Table 57. MSCs last week, as a predictor

Predictor	β	F	Total R^2
Musculoskeletal Disorder Complaints – Week	.09**		
Authentic Durable Happiness – Content	-.39**		
Authentic Durable Happiness – Peace	-.18**		
Subjective Fluctuating Happiness	.15**		
Age	.04		
Gender	-.06		
Active in Sports	-.01		
Years Practicing Dentistry	-.06		
		40.21**	.48

Notes. * P< .05, ** p< .01

Gender coded were 0= female, 1= male

Active in Sports coded were 0= no, 1= yes

Yearly scale of musculoskeletal complaints

As shown in Table 58 with the yearly version of musculoskeletal complaints, the model was statistically significant (F = 40.90**, p< .01) and the variables in the model account for 48% of the variability in perceived stress. When looking at the standardized Beta coefficients, there were four significant predictors. Dentists who reported experiencing musculoskeletal complaints within the last year had higher levels of perceived stress (β = .12**, p< .01). Dentists who reported contentment and inner peace had lower levels of perceived stress (β = -.39** and -.18**, p< .01; contentment and Inner Peace, respectively). Finally dentists who reported higher levels of subjective fluctuating happiness were more likely to report perceived stress (β = .16**, p< .01). The other predictors (e.g., age, gender) were not statistically significant.

Multiple Regression Model Predicting Perceived Stress (with Musculoskeletal Complaints within the last Year as a predictor).

Table 58. MSCs Last Year, as predictor of stress

Predictor	β	F	Total R^2
Musculoskeletal Disorder Complaints – Last 12 Months	.12**		
Authentic Durable Happiness – Content	-.39**		
Authentic Durable Happiness – Peace	-.18**		
Subjective Fluctuating Happiness	.16**		

Age	.03		
Gender	-.05		
Active in Sports	.03		
Years Practicing Dentistry	-.08		
		40.90**	.48

Notes.

* p< .05, ** p< .01

Gender coded were 0 = female, 1= male

Active in Sports coded were 0 = no, 1 = yes

Work absence scale of musculoskeletal complaints

As shown in Table 59, with the "work absence version of musculoskeletal complaints", the model is statistically significant (F= 40.60**, p< .01) and the variables in the model account for 48% of the variability in perceived stress. When looking at the standardized Beta coefficients, there were four significant predictors. Dentists who reported missing work last year had higher levels of perceived stress (β= .08*, p< .05). Dentists who reported contentment and inner peace had lower levels of perceived stress (β= -.38** and - .23**, p< .01), respectively. Finally dentists who reported higher levels of subjective fluctuating happiness were more likely to report perceived stress (β= .17**, p< .01). The other predictors (e.g., age, gender) were not statistically significant.

Multiple Regression Model Predicting Perceived Stress (with Musculoskeletal Complaints impacting Work within the last Year as a predictor)

Table 59. MSC Work absence, as a predictor

Predictor	β	F	Total R^2
Musculoskeletal Disorder Complaints – Work	.06*		
Authentic Durable Happiness – Content	-.39**		
Authentic Durable Happiness – Peace	-.21**		
Subjective Fluctuating Happiness	.16**		
Age	.01		
Gender	.08*		
Active in Sports	-.01		
Years Practicing Dentistry	-.04		
		40.60**	.48

Notes.

* p< .05, ** p< .01

Gender coded were 0 = female, 1= male

Active in Sports coded were 0 = no, 1 = yes

II. 2. Hypotheses 8 to 13

Multiple regression model predicting Musculoskeletal Complaints

Two multiple regression analyses were conducted to test hypotheses 8 – 13. The first regression predicted musculoskeletal complaints over the last week and the second regression predicted musculoskeletal complaints over the last year. Very few dentists reported that their musculoskeletal complaints impacted their work over the last year. Since these questions had low variability (Mean = 1.05; SD = .19), a regression model was not conducted for this outcome variable.

Musculoskeletal complaints over the last week

As shown in Table 60, the predictors explained 14% of the variability in reported musculoskeletal complaints over the last week ($F= 8.00^{**}$, $p< .01$). When looking at the standardized Beta coefficients, there were only two significant predictors. Dentists who reported experiencing contentment were less likely to report musculoskeletal complaints within the last week ($\beta= -.19^{**}$, $p< .01$) and male dentists were less likely to report musculoskeletal complaints within the last week than their female counterparts ($\beta= -.19^{**}$, $p< .01$).

Multiple Regression Model Predicting Musculoskeletal Complaints within the last Week

Table 60. Predictor MSCs, last week

Predictor	β	F	Total R^2
Authentic Durable Happiness – Content	-.19**		
Authentic Durable Happiness – Peace	-.04		
Subjective Fluctuating Happiness	.09		
Age	-.07		
Gender	-.19**		
Active in Sports	-.10		
Years Practicing Dentistry	.15		
		8.00**	.14

Notes:

. p< .05, ** p< .01

Gender coded were 0= female, 1= male

Active in Sports coded were 0 = no, 1 = yes

Musculoskeletal complaints over the last year

As shown in Table 61, the predictors explained 11% of the variability in reported musculoskeletal complaints over the last year (F= 5.94**, p< .01). The results followed the same pattern as those predicting musculoskeletal

complaints over the last week. Dentists who reported experiencing contentment were less likely to report musculoskeletal complaints within the last year (β= -.17*, p< .05) and male dentists were less likely to report musculoskeletal complaints within the last year than their female counterparts (β = -.21**, p< .01).

Multiple Regression Model Predicting Musculoskeletal Complaints within the last Year

Table 61. Predictor MSCs, last year

Predictor	β	F	Total R^2
Authentic Durable Happiness – Content	-.17*		
Authentic Durable Happiness – Peace	-.05		
Subjective Fluctuating Happiness	.01		
Age	-.00		
Gender	-.21**		
Active in Sports	-.08		
Years Practicing Dentistry	.07		
		5.94**	.11

Notes:

* p< .05, ** p< .01

Gender coded where 0 = female, 1= male

Active in Sports coded where 0 = no, 1 = yes

II. 3. Hypotheses 14 to 17

Multiple regression model predicting Authentic-Durable Happiness

Three multiple regression analyses were conducted to examine predictors of authentic durable happiness. The first analysis examined predictors of the contentment dimension, the second analysis examined predictors of the Inner Peace dimension, and the third analysis examined predictors of authentic-durable happiness.

Authentic Durable Happiness – Contentment

As seen in the Table 62, the model only explained 6% of the variability of contentment ($F = 5.67^{**}$, $p < .01$) with being active in sports as the only significant predictor ($\beta = .19^{**}$, $p < .01$). Dentists who participated in sports were more likely to report feelings of contentment.

Table 62. Predicting Contentment, Multiple Regression Model Predicting Authentic Durable Happiness –Contentment dimension

Predictor	β	F	Total R^2
Age	-.05		
Gender	.02		
Active in Sports	.19**		
Religious Involvement	.08		
		5.67**	.08

Notes:

p< .05, ** p< .01

Gender coded were 0 = female, 1= male

Active in Sports coded were 0= no, 1= yes

Religious Involvement coded were 0 = no, 1 = yes

Authentic Durable Happiness – Inner Peace

The second analysis examined predictors of the Inner Peace dimension. As seen in the Table 63, the model only explained 4% of the variability of contentment (F = 2.54*, p< .05) with being active in sports as the only significant predictor (β = .14**, p< .01). Dentists who participated in sports were more likely to report feelings of Inner Peace.

Table 63. Predicting Inner Peace, Multiple Regression Model Predicting Authentic Durable Happiness – Inner Peace dimension

Predictor	β	F	Total R^2
Age	-.23		
Gender	.02		
Active in Sports	.14**		
Religious Involvement	.06		
		2.54*	.04

Authentic-durable happiness

The third analysis examined predictors of the authentic-durable happiness. As seen in Table 64, the model only explained 5% of the variability of authentic-durable happiness (F= 4.74**, p< .01) with being active in sports as the only significant predictor (β= .19**, p< .01). Dentists who participated in sports were more likely to report feelings of authentic-durable happiness.

Table 64. Predicting Authentic-Durable Happiness, Multiple Regression Model Predicting Authentic Durable Happiness

Predictor	β	F	Total R^2
Age			
Gender			
Active in Sports	.19**		
Religious Involvement			
		4.74**	.05

II. 4. Hypotheses 18 to 21

Multiple regression model predicting Fluctuating Happiness

One multiple regression analysis was conducted to test the remaining hypotheses (hypotheses 18-21). The first analysis examines predictors of subjective fluctuating happiness. As seen in Table 65, the model only explained 2% of the variability of fluctuating happiness and was not statistically significant (F= 1.40; ns). However, there was one statistically significant predictor. Dentists who participated in sports were less likely to report feeling fluctuating happiness (β = -.11*, p< .05).

Table 65. Predicting Fluctuating Happiness, Multiple Regression Model Predicting Subjective Fluctuating Happiness

Predictor	β	F	Total R^2
Age	-.03		
Gender	-.02		
Active in Sports	-.11*		
Religious Involvement	-.06		
		1.40	.02

III. Direct answers to individual hypothesis

In this section, direct answers will be presented for each individual formulated Hypothesis for Study 3.

Hypothesis 1

Stress was a predictor of the prevalence of musculoskeletal disorders complaints in both the last 7 days (β= .09**; p< .01) and the last 12 months (β= .12**; p< .01).

Hypothesis 2

Stress in Portuguese dentists was a significant predictor of the prevalence of authentic-durable happiness both for contentment (β= -.39**; p< .01) as well as for Inner Peace (β= -.18**; p< .01).

Hypothesis 3

Stress in Portuguese dentists was a predictor of the prevalence of fluctuating happiness (β= .15**; p< .01).

Hypothesis 4

Stress level among dentists was not predictor by their age (β= .04).

Hypothesis 5

Female Portuguese dentists had higher stress (mean= 18.14) than male Portuguese dentists (mean= 16.89), and the difference was statistically significant (t (397)= 2.21; p=0.03).

Hypothesis 6

Stress level among Portuguese dentists was negatively correlated with their practice of sport activities (r= -.15**; p< .01). However, when used along with other predictor variables it did not show statistical significance (β= -.01).

Hypothesis 7

Stress levels among Portuguese dentists, although negatively correlated with years of practicing Dentistry, it did not reach statistical significance (β= -.06) when used in conjunction with other predictor variables.

Hypothesis 8

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was a predictor of the prevalence of contentment, both for last 7 days (β= -.19**; p< .01) and last 12 months (β= -.17**; p< .01). Inner Peace, although correlated, it did not reach statistical significance, both for last 7 days (β=-04) and last 12 months (β= -.05).

Hypothesis 9

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was positively correlated with the prevalence of fluctuating happiness, both for the presence of signs and symptoms in the last 7 days (r= .23**; p< .01) and in the last 12 months (r= .14**; p< .01). However, when used in conjunction with other predictor variables, it did not reach statistical significance (β= .09 and β= .01 for last 7 days and last 12 months, respectively).

Hypothesis 10

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was not correlated (β= -.07, for the last seven days; β= -.00, for the last 12 months) with their age.

Hypothesis 11

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was correlated with their gender (β= -.19**, for last 7 days and (β= -.21**for last 12 months). Female dentists presented more

complaints than males, both in the last 7 days (t (397)= 3.47; p= .00) and in the last 12 months (t (397)= 3.90; p= .00).

Hypothesis 12

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was negatively correlated with the practice of sport activities both, for complaints in the last 7 days (r= -.18**; p< .01) and in the last 12 months (r= -.14**; p< .01). However, when all predictor variables were used, practice of sports did not reach statistical significance as a predictor (β= -.10 for last 7 days and β= -.08 for last 12 months).

Hypothesis 13

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was not correlated with years of practicing Dentistry (β= .15, for the last 7 days; β= .07 for the last 12months).

Hypothesis 14

The prevalence of authentic-durable happiness among Portuguese dentists was negatively correlated with age, with no statistical significance both for contentment (β= -.05) and for Inner Peace (β= -.23) dimensions.

Hypothesis 15

There was no correlation between genders in the prevalence of authentic-durable happiness among Portuguese dentists both for contentment (β= .02) and for Inner Peace (β= .02) dimensions.

Hypothesis 16

There was no correlation between the prevalence of authentic-durable happiness among Portuguese dentists and their religious involvement both for contentment (β= .08) and for Inner Peace (β= .06) dimensions.

Hypothesis 17

The practice of sport activities was a significant predictor, among the other predictor variables, for the prevalence of authentic-durable happiness (β= .19**; p< .01) among Portuguese dentists. Both for contentment (β= .19**; p< .01) and for Inner Peace (β= .14**; p< .01) dimensions.

Hypothesis 18

The prevalence of fluctuating happiness among Portuguese dentists although negatively correlated with their age, it was not statistically significant (β= -.03).

Hypothesis 19

The prevalence of fluctuating happiness among Portuguese dentists (Mean= female: 3.30; male: 3.26) was not correlated with their gender (β= -.02; t (397)= .29; p= .77).

Hypothesis 20

Although the prevalence of fluctuating happiness among Portuguese dentists was negatively correlated with their religious involvement, it was not statistically significant (β= -.06).

Hypothesis 21

The practice of sport activities was a predictor for the prevalence of fluctuating happiness among Portuguese dentists (β= -.11*; p< .05).

CHAPTER V

DISCUSSION

STRESS

As scores from PSS had been reported with the full scale and with the short PSS-10 items (Ribeiro & Marques, 2009; Trigo, Canudo *et al.*, 2010), discussion will be done for both scales.

On full scale of perceived stress, Portuguese dentists presented a mean level of 22.99, which is significantly higher (t (406)= 9.97; p= .00) than it is for the general Portuguese population, in which the mean is 19.96 according to Ribeiro & Marques (2009). As it could be argued that those values for the general Portuguese population were based on a small sample (n= 45), it was founded an ensured way to compare the values found in this study with a larger study developed among general Portuguese population. On that study, Trigo *et al.* (2010), evaluated stress with PSS-10, by using a sample of 762 individuals, plus a sample of 201 of people with some physical or anxious disorder (Trigo, Canudo *et al.*, 2010). Mean values from that larger study, corroborated the idea that Portuguese dentists presented a significantly high level of stress (t (406)= 8.40; p= .00), if compared to general Portuguese

population. Whereas the mean value for dentists was 17.62, the mean value for general Portuguese people was 15.33, on short-10 items PSS. The mean values of stress in Portuguese dentists were similar to those found by Remor (2006) for the Spanish population (PSS-10 items= 17.6).

In spite of presenting a high score for stress (PSS-10, mean =17.62), comparing with general populations (PSS-10, mean=15.33), Portuguese dentists were far from being considered as stressed as patients suffering from pathologic anxiety, which scored 24.1 in a national survey with the same short version of the scale (Trigo, Canudo *et al.*, 2010).

The results obtained in the present study were identical to several published studies agreeing on the fact that stress level is high among dentists (Ayers, Thomson *et al.*, 2009; Ayers, Thomson *et al.*, 2008; Newton & Gibbons, 1996; Turley, Kinirons *et al.*, 1993; Wilson, Coward *et al.*, 1998), being dentistry one of the most stressful health professions (Palliser, Firth *et al.*, 2005).

Self- evaluation of stress

Only 17% of dentists auto evaluated themselves as do “not have”, or “rarely have” stress in their lives, which suggest that Portuguese dentists felt more stress in their lives than did other colleagues, who reported that they felt their lives “not very” or “not at all” stressful in 30% (Ayers, Thomson *et al.*, 2009). More than 80% of Portuguese dentists self-evaluated the presence of stress in their lives, which is in agreement with published studies arguing that the group of professional dentists is very stressful (Gerschman, 1998; Myers

& Myers, 2004), and could be compared to some dentists self-evaluation from other countries with 70% of them describing their life as being very or fairly stressful (Ayers, Thomson *et al.*, 2009).

Self- evaluation of Health

On the self perceived health assessed by the widely used single question (Gana, Bailly *et al.*, 2013; Røysamb, Tambs *et al.*, 2003), only 25% of Portuguese dentists reported their general health as being “very good” and 61% as being good, which is far away from the results, for example, of the dentists in New Zealand who reported their health as being “very good” for 71% and good for 30% (Ayers, Thomson *et al.*, 2009). This could be explained by the fact that 40% of dentist from that study (Ayers, Thomson *et al.*, 2009) also reported to feel free from pain or discomfort, while in the study among Portuguese dentists only a few percentage of respondents reported do not have complaints during last week (11.8%) or last year (9.3%).

MSDs

The internal consistency of the new musculoskeletal questionnaire (MSQ) was evaluated for the entire scale as well as for the subscales for the questions related to the complaints during the last week, the last year and those which impacted work. As the Cronbach alpha was hight for all scales, it

could be considered that MSQ had a satisfactory internal consistency and could be applied when researchers are looking for a more simplified version of the original Nordic Musculoskeletal questionnaire. However, it could be recommended beforehand to develop further investigation to support reliability not only through the internal consistency but also with test-retest reliability .

Furthermore, the MSQ could allow for presenting results not only in terms of percentages -as till the present time (Fonseca & Serranheira, 2006; Mesquita, Ribeiro *et al.*, 2010; Serranheira, Cotrim *et al.*, 2012; Serranheira, Pereira *et al.*, 2003), but also with the mean value for the intensity of the pain felt both during the last week and the last year, making this version of musculoskeletal questionnaire a new tool to compare complaints from MSD between samples.

However, as MSQ is a simplified version it does not allow to distinguish between left and right side complaints of MSDs.

The prevalence of symptoms of MSD among Portuguese dentists was high, with 88.2% of them reporting complains for at least one body region during the last week, and 90.7% on the last year. These results corroborate several studies supporting the idea that the prevalence of symptoms of MSD is always high among dentists (Alexopoulos, Stathi *et al.*, 2004; Ayers, Thomson *et al.*, 2009; Cherniack, Dussetschleger *et al.*, 2010; Feng, Liang *et al.*, 2014; Harutunian, Gargallo-Albiol *et al.*, 2011; Kierklo, Kobus *et al.*, 2011; Leggat & Smith, 2006; Memarpoura, Badakhshb *et al.*, 2013).

However, it seemed that Portuguese dentists experienced even more symptoms than colleagues from other countries: in New Zealand 53% of dentists mentioned symptoms in up to four body areas, in the previous week and last year (Palliser, Firth *et al.*, 2005); 79,8% of Spanish dentists had

experienced some kind of MS pain in the last 6 months (Harutunian, Gargallo-Albiol *et al.*, 2011). For Sweden dentists the presence of musculoskeletal disorders were about 87% (Rolander & Bellner, 2001), and for Scandinavian dentists were about 70% (Cherniack, Dussetschleger *et al.*, 2010). It could be advisable to develop more comparative studies in order to evaluate if this difference could be related to individual habbits or to the lack of awareness for this subject at dental schools during the under-graduate studies.

Anyway, it seems to be urgent that preventive measures for MSDs must be implemented during dental training.

Neck, back and shoulders were the most prevalent regions with MSS among Portuguese dentists corroborating several studies pointing out the affected body regions for this professional group (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Hayes, Cockrell *et al.*, 2009; Leggat & Smith, 2006; Memarpoura, Badakhshb *et al.*, 2013; Morse, Bruneau *et al.*, 2010; Palliser, Firth *et al.*, 2005; Rafeemanesh, Jafari *et al.*, 2013; Rolander & Bellner, 2001; Rolander, Karsznia *et al.*, 2005).

Portuguese dentists scored a high level in the lower back complaints (54,9% and 64,3%, respectively for last week and last year) which matched very well with what has been reported in recent studies classifying lower back pain as the most prevalent MS problem among dentists (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Hayes, Cockrell *et al.*, 2009; Morse, Bruneau *et al.*, 2010; Rafeemanesh, Jafari *et al.*, 2013). Furthermore, its prevalence is also high for Greek (62%), Sweden (Cherniack, Dussetschleger *et al.*, 2010; Rolander, Karsznia *et al.*, 2005), Australian, Queensland 53.7% (Leggat & Smith, 2006), Spanish (52.7%) dentists

(Harutunian, Gargallo-Albiol *et al.*, 2011) and dentists from Nepal and Iran (Rafeemanesh, Jafari *et al.*, 2013).

As pain neck often radiates to shoulder, making difficult to clearly identify the painfull area (Memarpoura, Badakhshb *et al.*, 2013), some studies do not reported neck and shoulders pain separately, making it even more difficult to compare the prevalence of these conditions (Hayes, Cockrell *et al.*, 2009) and results vary greatly between studies (Hayes, Cockrell *et al.*, 2009).

Neck and shoulders all together became the most important complaint for dentists worldwide, being them at USA (Morse, Bruneau *et al.*, 2010), New Zealand (Palliser, Firth *et al.*, 2005) or Netherlands (Droeze & Jonsson, 2005). In Australian and Greece the prevalence is about 87% and 62%, respectively (Cherniack, Dussetschleger *et al.*, 2010).

The prevalence among Portuguese dentists for neck complaints during the last week was 56%, and 69% if it was asked about the last year. These results are similar to those found for Spanish (58%) dentists (Harutunian, Gargallo-Albiol *et al.*, 2011), and dentists respondents in New Zealand for last year (63%). Nevertheless, Portuguese dentists reported higher levels than those reported by the dentist in New Zealand (27%) for last week (Palliser, Firth *et al.*, 2005), and lower than those (83.8%) reported by Chinese dentists (Feng, Liang *et al.*, 2014). Neck pain is the natural consequence of neck flexion - sustained by dentists during 90% of their working time (Branson, Black *et al.*, 2010), and also reported by some others oral care workers, as oral hygienists with high prevalence (52%) of MSS on their neck (Duarte & Serranheira, 2015). Thus, it seems advisable to implement preventive measures for MSDs not only among dental students but also among dental oral workers .

One of the most reported regions for complaints among Portuguese dentists was - after neck, back and shoulders - the group “wrist and hands”, ranging on 37,7%. This prevalence is indeed higher for dentists than for to Portuguese warehouse workers (Mesquita, Ribeiro *et al.*, 2010) or carmakers (Serranheira, Pereira *et al.*, 2003).

Hand and wrist were reported in some studies (Harutunian, Gargallo-Albiol *et al.*, 2011; Hayes, Cockrell *et al.*, 2009; Palliser, Firth *et al.*, 2005) as one of the most prevalent symptoms, after neck, back and shoulders, corroborating other studies which demonstrated also that complaints on hands were recognized as a distinct occupational hazard (Cherniack, Dussetschleger *et al.*, 2010) in this professional group.

Very few Portuguese dentists reported that their MSC had impact on their work, over the last year (Mean= 1.05; SD= .19) which was corroborated by other researchers that found that dental professionals used to keep doing their jobs despite experiencing MS symptoms (Cherniack, Dussetschleger *et al.*, 2010), often or always in pain (Feng, Liang *et al.*, 2014).

HAPPINESS

Portuguese dentists scored 3.32 in a 1.0 to 7.0 possible range of score for subjective fluctuating happiness (SFHS). These values were statistically significant different from the general Portuguese population ($t(2611) = -4.06$, $p < .01$), with dentists reporting lower levels of subjective fluctuating happiness (See Chapter II). These results could be expected by the higher socio economic and educational level of dentists if compared with the general

population, as according to Chapter II (SFHS validation) it was reported that fluctuating happiness was negatively correlated with educational (r= -.13**; p< .01) and socio-economical level (r= -.10**; p< .01). See Table 28, Chapter II.

Further studies should be conducted to determine whether socioeconomic level, educational level or some other variables could be related with subjective happiness.

Furthermore, Portuguese dentists presented statistically significant (t(446)= -10.48; p= .00) lower level of fluctuating happiness than those reported by Dambrun (mean= 3.92) for the French population (Dambrun, Ricard *et al.*, 2012).

The levels of authentic-durable happiness on Portuguese dentists (mean=4.54) were statistically different (t(425)= 4.74; p= .000) and higher from those (mean= 4.31) reported by Dambrun *et al.* (2012) for the French population. However, there was no significant difference (t(2559)= -1.18; p= .24) between authentic-durable happiness on Portuguese general population and among Portuguese dentists. Additionally, there were no significant differences between dentists and the general Portuguese population on either contentment (t(2556)= -1.20, ns) or inner peace (t(2555)= -.89, ns).

More results for happiness among general Portuguese people are presented on Chapter II, with the validation of SFHS and SA-DHS.

RELATIONSHIP BETWEEN HAPPINESS, STRESS AND MUSCULOSKELETAL DISORDERS AMONG PORTUGUESE DENTISTS

Stress with MSDs complaints

In this study stress is positively correlated with the prevalence of musculoskeletal disorders complaints in both the last 7 days (r= .30**; p< .01) and the last 12 months (r= .28**; p< .01).

These results are in agreement with countless previous studies supporting the idea that stress is a risk factor for MSDs (Cherniack, Dussetschleger *et al.*, 2010; Droeze & Jonsson, 2005; Feng, Liang *et al.*, 2014; Fischer, Marshall *et al.*, 2012 ; GraçA, AraújJo *et al.*, 2006; Gupta, Ankola *et al.*, 2013; Kierklo, Kobus *et al.*, 2011; Melamed, 2009; Morse, Bruneau *et al.*, 2010; Palliser, Firth *et al.*, 2005; Rolander & Bellner, 2001; Sousa, 2012; Yamalik, 2007).

Both psychological and emotional stress are, in fact, important factors not only to initiate MSDs (Fischer, Marshall *et al.*, 2012 ; Kierklo, Kobus *et al.*, 2011), but also to worsen them (Tanikonda & Koneru, 2014), causing musculoskeletal pain (Kierklo, Kobus *et al.*, 2011) and affecting their development and progression (Fischer, Marshall *et al.*, 2012).

Furthermore, in this study, when looking at the standardized Beta coefficients of multiple regression analysis, musculoskeletal complaints were significant predictors of perceived stress. Dentists who reported experiencing musculoskeletal complaints had higher levels of perceived stress during the last week (β = .09**, p< .01), the last year (β = .12**, p< .01) and, even not so

strongly, with those who were absentee to work because of musculoskeletal complaints (β = .08*, p< .05). This results highlight the positive relationship between high perceived stress and the presence of MSDs (Memarpoura, Badakhshb *et al.*, 2013).

Considering some studies pointing out that MSDs are progressive, sometimes invisible and so often highly stigmatized, as well as associated with periods of severe chronic pain and reduced mobility (Baker, Gallois *et al.*, 2011) and that chronic MSP negatively affects people's live (Damsgard, Dewar *et al.*, 2011) the results of this study may suggest that stress among dentists is caused not only by the inherent fact that dentistry is stressful (Ayers, Thomson *et al.*, 2009; Ayers, Thomson *et al.*, 2008; Cherniack, Dussetschleger *et al.*, 2010; Newton & Gibbons, 1996; Schmitter, Liedl *et al.*, 2008; Turley, Kinirons *et al.*, 1993; Wilson, Coward *et al.*, 1998), and demanding (Ayers, Thomson *et al.*, 2009; Perez-Padron, Bernabé *et al.*, 2010; Tezel, Kavrut *et al.*, 2005) but also because dentists have to deal with the symptoms of MSDs. Consequentely, the presence of high stress levels among dentists seems to be related, to some extent, to the practice of dentistry or to the presence of MS pain related to that practice. As it is a new explanantion for the prevalence of stress, it should be further explored and evaluated.

Stress in Portuguese dentists is positively correlated with the prevalence of fluctuating happiness (r= .51**; p< .01). Dentists who reported higher levels of subjective fluctuating happiness were more likely to report perceived stress, leading subjective fluctuating happiness as a predictor for stress (β= .15**; p< .01).

Since this is the first study correlating perceived stress with fluctuating happiness, it is not possible to compare results with other authors. In the study for the development of SFHS, fluctuating happiness has been positively and significantly related to depression and psychological distress (Dambrun, Ricard *et al.*, 2012). Furthermore, the results could also be explained considering that fluctuating happiness is related to a self-centered attitude (Dambrun, Ricard *et al.*, 2012) with the main focus on obtaining pleasure and avoiding displeasure; as this repetitive alternation of phases are depending on circumstances and induces fluctuating happiness (Dambrun & Ricard, 2011; Dambrun, Ricard *et al.*, 2012) it was expectable that fluctuating happiness was a predictor for stress.

In this study, stress among Portuguese dentists was negatively correlated with the prevalence of authentic-durable happiness for contentment (β= -.39**; p< .01) as well as for Inner Peace (β= -.18**; p< .01). As there is no study correlating authentic-durable happiness with stress, it seem to be interesting to notice that in the study for the development of SA-DHS, authentic-durable happiness has been significantly and negatively correlated with the measures of depression and psychological distress (Dambrun, Ricard *et al.*, 2012). Moreover, the authors of the scale have reported that the presence of cortisol in the saliva was negatively related with it (Dambrun, Ricard *et al.*, 2012). It has to be pointed that, in spite of the absence of studies directly correlating stress with authentic and durable happiness, some authors studied the relation between stress and happiness concluding that the correlation was considered as negative (Moljord, Moksnes *et al.*, 2011).

Stress with gender and age

Gender was not a significant predictor (β= .08*; p< .05) for stress, in spite of female Portuguese dentists had reported higher stress levels (mean= 18.14) than their male colleagues (mean= 16.89), with a statistically significant difference (t (397)= 2.21; p=0.03). These results about stress, matched very well with several other studies reporting female doctors (Harvill, 1986) and female dentists (Memarpoura, Badakhshb *et al.*, 2013; Pozos-Radillo, Lopez *et al.*, 2008) with higher levels of stress than their male peers, even though some authors (Taskaya-Yilmaz, Ceylan *et al.*, 2004) reported that women did not have higher levels of occupational stress higher than those found among males. However, the results of the World Happiness Report, 2015 for global population, pointed males between 20 and 50 reporting significantly more stress than women whith the same age, and the opposite in older groups (Fortin, Helliwell *et al.*, 2015; "World happiness report," 2015), rating differently according to the regions.

Stress among dentists was not correlated with their age, nor the age was a predictor for it. Furthermore, the results obtained in this study concerning the relation between age and stress seemed to corroborate some previous studies who had shown that the increasing of chronological age and years of experience of dentistry resulted in lower levels of stress (Cooper, Watts *et al.*, 1987; Taskaya-Yilmaz, Ceylan *et al.*, 2004). These results could support the idea that as time goes by, people will develop ways of dealing with problems (Taskaya-Yilmaz, Ceylan *et al.*, 2004), becoming more resistant to pressure or developing coping strategies that help them overcome the most difficult situations (Tabak & Koprak, 2007).

Stress with practice of sport activities

The practice of sport activities was negatively correlated (r= -.18**; p< .01) with perceived stress which corroborates some recent studies (Downs & Ashton, 2011; Stults-Kolehmainen & Sinha, 2014). Nonetheless, it was not statistically significant as a predictor of stress (β= -.01, β= .03 and β= -.01, respectively for MSC last week, last year and missing work).

MS Complaints (MSCs)

MSCs were negatively related with authentic and durable happiness, both considering the last week (r= -.30**; p< .01) and last year (r= -.24**; p< .01) complaints. Furthermore, contentment was a significant – negative - predictor for onset of symptoms of MSCs on dentists (β = -.19**, p< .01 and β = -.17*, p< .05), respectively for complaints over the last week and the last year).

The prevalence of musculoskeletal disorders complaints among Portuguese dentists was positively correlated with the prevalence of fluctuating happiness, for both the presence of signs and symptoms in the last 7 days (r= .23**; p< .01) and in the last 12 months (r= .14**; p< .01).

As there are no previous studies comparing contentment, inner peace or fluctuating happiness with MSDs, further research should be conducted among different populations, to establish the relationship between the presence of MSCs with authentic durable happiness - specifically contentment and inner peace, and with fluctuating happiness. Namely those related to

fluctuating happiness, taking in account not only the high percentage of complaints dentists had, but also how depression is close to chronic pain (Simões, Gonçalves *et al.*, 2003) and fluctuating happiness (Dambrun, Ricard *et al.*, 2012).

The gender of dentists was strongly related with the reporting of MSC, with female dentist being more likely to report MSC than their male counterparts (β = -.19**, p< .01 for last week and β = -.21**, p< .01 for last year). These results were within our expectancies and in concordance with Memarpour *et al.*, in 2012, and identical to several studies on female dentists reporting more complaints of MSDs than male colleagues (Ayers, Thomson *et al.*, 2009; Cherniack, Dussetschleger *et al.*, 2010; Harutunian, Gargallo-Albiol *et al.*, 2011; Khang & Kim, 2010; Memarpoura, Badakhshb *et al.*, 2013; Pinheiro, Tróccoli *et al.*, 2002; Rolander & Bellner, 2001; Stubbs, Krebs *et al.*, 2010; Tanikonda & Koneru, 2014; Yamalik, 2007), both in frequency (Harutunian, Gargallo-Albiol *et al.*, 2011) and severity (Hayes, Cockrell *et al.*, 2009). Those results are also consistent with data from international health surveys, which show that pain prevalence is higher among women (Fortin, Helliwell *et al.*, 2015; "World happiness report," 2015).

Age, as well as the number of years of practice, had no statistical significance as a predictor to the presence of MSCs among Portuguese dentists, which does not match the reported ideia (Memarpoura, Badakhshb *et al.*, 2013) that age and years of practice are positively correlated with the number of areas in pain. Nevertheless, as symptoms of MSD appear very early in careers, with higher prevalence of MSD during dental education (Ayers, Thomson *et al.*, 2009; Faria, 2011; Gupta, Ankola *et al.*, 2013), and among younger dentists (Memarpoura, Badakhshb *et al.*, 2013) it seems that

MSCs are high among dental practice, no matter the age of the dentist or how long they are practicing, making it urgent the implementation of preventive measures.

Sport activity although was not a predictor variable for MSCs (β= -.10 and β = -.08, respectively for last week and last year), is negatively correlated with the presence of sign and symptoms of musculoskeletal disorders during the last 7 days (r= -.18**; p< .01) and the last 12 months (r= -.14*; p< .05). Eventhough it is quite difficult to find studies reporting the correlations between the dentists' sport activities and MSD complaints, this result is consistent with Memarpour et al., who highlighted this negative correlation (Memarpoura, Badakhshb *et al.*, 2013), and with the ideia that an untrained body is a risk factor for MSDs (Droeze & Jonsson, 2005). Furthermore, some authors had warned dentists to the importance of physical exercise not only for their health (Szymanska, 2002), but also for MSDs prevention (Kumar, Rathan *et al.*, 2014; Memarpoura, Badakhshb *et al.*, 2013; Yi, Hu *et al.*, 2013) and rehabilitation (Harutunian, Gargallo-Albiol *et al.*, 2011), and for decreasing the risk of MSS among dentists (Feng, Liang *et al.*, 2014; Memarpoura, Badakhshb *et al.*, 2013).

In this study, being active in sports was a positive significant predictor (β= .19**, p< .01) for authentic-durable happiness, as well as for contentment (β= .19**, p< .01) and for Inner Peace (β= .14**, p< .01). This result could reinforce the ideia that the happiness could be implemented by physical activities (Moljord, Moksnes *et al.*, 2011).

Additionally, the only one predictor statistically significant for fluctuating happiness was the practice of sport activities in a negative relation: dentists who participated in sports were less likely (β= -.11*, p< .05) to report

feeling of fluctuating happiness. Further studies should be conducted to determine the relation between both authentic-durable and fluctuating happiness with sport activities, to fill in the emptiness of research on this field.

However, as the results of this study reported physical exercises as significant predictors, both to improve authentic-durable happiness and to decrease fluctuating happiness, and as several studies related physical exercise as having several benefits for health (Argyle, 2001; Baena-Beato, Artero *et al.*, 2014; Gupta, Ankola *et al.*, 2013; Kumar, Rathan *et al.*, 2014; Neto, Junior *et al.*, 2013; Szymanska, 2002; Yi, Hu *et al.*, 2013) it looks like it could be strongly recommended that dentists will engage in sport activities, according to their preferences, needs or availability.

Furthermore, when Pearson's correlation was done with the scales and the practice of Yoga it could be found that Yoga was positively correlated with contentment ($r= .21^{*}$; $p< .05$) and negatively correlated with perceived stress ($r= -.25^{*}$; $p< .05$). Having in consideration the fact that contentment was strongly and negatively related with reported MSCs ($\beta= -.19^{**}$; $p< .01$, for last week and $\beta= -.17^{*}$; $p< .01$, for last years) and perceived stress ($\beta= -.39^{**}$; $p< .01$) it could be suggested that, in agreement with other authors the practice of Yoga may be recommended (Gupta, Ankola *et al.*, 2013) because it can minimize MSCs not only in general population (Hartfiel, Burton *et al.*, 2012) and in general doctors (Tanikonda & Koneru, 2014) but also in dentists.

This study has some limitations that must be considered.

Firstly, it must be taken in consideration the method: this was an observational cross-sectional survey type of study with data related to the moment people fill it. It would be valuable to develop longitudinal studies on this matter, to evaluate how consistent results will be over time.

Secondly, it would be considered relevant and innovated to include some biological markers, such as the presence of salivary cortisol among respondents, and correlate the presence of them with subjective happiness, both fluctuate and authentic-durable happiness, and with the presence and the intensity of complaints from musculoskeletal disorders.

Furthermore, as anxiety, according to several theoretical studies, is also high among dentists it could be relevant and innovated to include an anxiety survey to be able to relate anxiety with signs and symptoms of musculoskeletal disorders, as well as to subjective fluctuating and authentic-durable happiness.

Future research should include, not only the markers and constructs named above, but also longitudinal studies on how physical and mental training could influence the anxiety and the stress levels, the subjective happiness on dentists, the salivary cortisol levels as well as the presence of complaints from musculoskeletal disorders.

Furthermore, it can be required some continuing education actions to develop and implement on dental students the awareness of how important emotion regulation could be in their personal and professional lives, and in their physical and mental health. Also, it can be recommended to implement on dental schools the awareness of how emotional and posture balance are crucial for their achievement both as dentists and human beings. The above mentioned measures would not only improve mental, emotional and physical health on dentists but also contribute to improve their happiness and well-being as well as to provide patients with the very best care dentists can afford them.

CHAPTER VI

CONCLUSIONS

From the studies of Happiness, Stress and Musculoskeletal Disorders (MSDs) developed in this thesis, the following conclusions can be drawn:

HAPPINESS, STRESS AND MSDS IN PORTUGUESE DENTISTS

1. The stress level is high among dentists.

2. Professional stress is present among dentists – there was no dentist self- assessing his/her professional stress as non-inexistent.

3. The results require the rejection of the null hypothesis that there is no significant difference between the stress levels on Portuguese dentists and Portuguese population: Portuguese dentists presented higher levels of stress than the general Portuguese population.

4. The presence of musculoskeletal complaints is high among dentists.

5. Almost all dentists reported musculoskeletal complaints on at least one body region.

6. Portuguese dentists had high prevalence of musculoskeletal complaints from neck, back, shoulders and wrists.

7. The results require the rejection of the null hypothesis that there is not a significant difference on the prevalence of musculoskeletal disorders complaints between Portuguese dentists and Portuguese population in general; dentists present a higher percentage of complaints than the Portuguese general population.

8. The results require the rejection of the null hypothesis: Portuguese dentists reported lower levels of fluctuating happiness than the general Portuguese population.

9. The results require the acceptation of the null hypothesis that there is not a significant difference in the prevalence of authentic durable happiness between Portuguese dentists and the general Portuguese population.

RELATIONSHIP BETWEEN HAPPINESS, STRESS AND MSD IN PORTUGUESE DENTISTS

1. Stress in Portuguese dentists was positively correlated with the prevalence of complaints related to musculoskeletal disorders.

2. Stress in Portuguese dentists is negatively correlated with the prevalence of authentic-durable happiness.

3. Stress in Portuguese dentists is positively correlated with the prevalence of fluctuating happiness.

4. Stress level among dentists is not correlated with their age.

5. Stress levels are higher in female dentists.

6. The stress level is negatively related to the practice of sports.

7. Stress levels among Portuguese dentists are not related with years of practicing Dentistry.

8. The prevalence of musculoskeletal disorders complaints is negatively correlated with the prevalence of authentic-durable happiness.

9. The prevalence of musculoskeletal disorders complaints is positively correlated with the prevalence of fluctuating happiness.

10. The prevalence of musculoskeletal disorders complaints has no correlation with age.

11. Female dentists present more musculoskeletal complaints than male dentists.

12. The prevalence of musculoskeletal complaints among Portuguese dentists is negatively correlated with the practice of sport activities.

13. The prevalence of musculoskeletal complaints among Portuguese dentists is not correlated with years of practicing Dentistry.

14. Age is not significant for the prevalence of authentic-durable happiness among dentists.

15. There is no correlation between gender and the prevalence of authentic-durable happiness in Portuguese dentists.

16. There is no correlation between the prevalence of authentic-durable happiness and religious involvement, among Portuguese dentists.

17. The prevalence of authentic-durable happiness among Portuguese dentists is strongly and positively correlated with their practice of sport activities.

18. The prevalence of fluctuating happiness in Portuguese dentists is not correlated with their age.

19. The prevalence of fluctuating happiness in Portuguese dentists is not correlated with their gender.

20. The prevalence of fluctuating happiness between Portuguese dentists does not correlate with their religious involvement.

21. The prevalence of fluctuating happiness between Portuguese dentists is negatively correlated with their practice of sport activities.

22. It seems strongly recommended that dentists regularly practice sport activities in order to improve their physical health, strengthen their body musculature, and thus, suffering less from musculoskeletal complaints and stress, and also, experiencing more happiness .

23. It could be recommended that dentists should be involved in contemplative practices, such as meditation, to improve their mental health, to strengthen their mind and balance emotional regulation, to improve happiness and to better adapt themselves to physical pain.

24. It seems important that dentists should be aware of the importance of positive emotions and positive psychology interventions in life

and particularly on stress, musculoskeletal disorders and happiness.

25. It can be recommended to teach dental students on how to deal with their demanding and stressful profession in a more balanced, healthy and happy way of life.

26. Lastly, being physically active may lead to less stress, and better physical and emotional health. Perhaps educators should not only strive to develop the academic skills that will lead to excellence in dentistry, but also help their students to achieve emotional goals. The latter will certainly improve their overall quality of life and professional conduct.

REFERENCES

Abu-Ghazaleh, SB, Rajab, LD, & Sonbol, HN. (2011). Psychological stress among dental students at the university of jordan. *Journal of Dental Education, 75*(8), 1107-1113.

Alexander, RE. (2001). Stress-related suicide by dentists and other health care workers. Fact or folklore? *J Am Dent Assoc, 132*(6), 786-794.

Alexopoulos, EC, Stathi, I-C, & Charizani, F. (2004). Prevalence of musculoskeletal disorders in dentists. *BMC Musculoskeletal Disorders 5*(16).

Algoe, SB, Haidt, J, & Gable, SL. (2008). Beyond reciprocity: Gratitude and relationships in everyday life. *Emotion, 8*(3), 425–429.

André, C, Kabat-Zinn, J, Rabhi, P, & Ricard, M. (2013). *Se changer, changer le monde*. Paris: L'Iconoclaste.

Argyle, M. (2001). *The psychology of happiness* (2nd ed.). USA and Canada: Taylor & Francis Inc.

Arrindell, WA, Heesink, J, & Feij, JA. (1999). The satisfaction with life scale (swls): Appraisal with 1700 healthy young adults in the netherlands. *Personality and Individual Differences, 26*, 815-826.

Ashby, FG, Isen, AM, & Turken, U. (1999). A neuropsychological theory of positive affect and its influence on cognition. *Psychological Review, 106*(3), 529-550.

Ayers, KMS, Thomson, WM, Newton, JT, Morgaine, KC, & Rich, AM. (2009). Self-reported occupational health of general dental practitioners. *Occupational Medicine, 59*, 142-148.

Ayers, KMS, Thomson, WM, Newton, JT, & Rich, AM. (2008). Job stressors of new zealand dentists and their coping strategies. *Occupational Medicine, 58*, 275-281.

Baena-Beato, PÁ, Artero, EG, Arroyo-Morales, M, Robles-Fuentes, A, Gatto-Cardia, MC, & Delgado-Fernández, M. (2014). Aquatic therapy improves pain, disability, quality of life, body composition and fitness in sedentary adults with chronic low back pain. A controlled clinical trial. *Clinical Rehabilitation, 28*(4), 350–360.

Bailey, KM, Carleton, RN, Vlaeyen, JWS, & Asmundson, GJG. (2010). Treatments addressing pain-related fear and anxiety in patients with chronic musculoskeletal pain: A preliminary review. *Cognitive Behaviour Therapy, 39*(1), 46–63.

Baker, SC, Gallois, C, Driedger, SM, & Santesso, N. (2011). Communication accommodation and managing musculoskeletal disorders: Doctor's and patient's perspectives. *Health Communication, 26*, 379–388.

Barker, RA, Barasi, S, & Neal, MJ. (2003). *Compêndio de neurociência*.

Barret, LF, Gross, JJ, Christensen, TC, & Benvenuto, aM. (2001). Knowing what you're feeling and knowing what to do about it: Mapping the relation between emotion differentiation and emotion regulation. *Cognition And Emotion, 15*(6), 713-724.

Bastian, B, Kuppens, P, Roover, KD, & Diener, E. (2014). Is valuing positive emotion associated with life satisfaction? *Emotion*.

Batum, P, & Yagmurlu, B. (2007). What counts in externalizing behaviors? The contributions of emotion and behavior regulation. *Current Psychology: Developmental • Learning • Personality • Social, 25*(4), 272-294.

Beck, AT. (2005). The current state of cognitive therapy. *Arch Gen Psychiatry, 62*(9), 953-959. doi: doi:10.1001/archpsyc.62.9.953.

Beer, JS, Knight, RT, & D'Esposito, M. (2006). Controlling the integration of emotion and cognition *Psychological Science, 17*(5).

Berking, M, Orth, U, Wupperman, P, Meier, LL, & Caspar, F. (2008). Prospective effects of emotion-regulation skills on emotional adjustment. *Journal of Counseling Psychology, 55*(4), 485–494.

Beuningen, Jv. (2012). The satisfaction with life scale examining construct validity. *The Hague/Heerlen: Statistic Netherlands*.

Bhattacharjee, A, & Mogilner, C. (2014). Happiness from ordinary and extraordinary experiences. *Journal of Consumer Research, 41*.

Birks, YF, & Watt, IS. (2007). Emotional intelligence and patient-centred care. *Journal of the Royal Society of Medicine, 100*.

Biswas-Diener, R, VittersØ, J, & Diener, E. (2005). Most people are pretty happy, but there is cultural variation: The inughuit, the amish, and the maasai. *Journal of Happiness Studies, 6*, 205-226.

Block, JP, He, Y, Zaslavsky, AM, Ding, L, & Ayanian, JZ. (2009). Psychosocial stress and change in weight among us adults. *American Journal of Epidemiology, 170*(2).

Boehm, JK, Lyubomirsky, S, & Sheldon, KM. (2011). A longitudinal experimental study comparing the effectiveness of happiness-

enhancing strategies in anglo americans and asian americans. *Cognition & Emotion*.

Boonstra, AM, Reneman, MF, Stewart, RE, Post, MW, & Preuper, HRS. (2013). Life satisfaction in patients with chronic musculoskeletal pain and its predictors. *Qual Life Res, 22*, 93–101.

Brake, HT, Bouman, A-M, Gorter, R, Hoogstraten, J, & Eijkman, M. (2007). Professional burnout and work engagement among dentists. *Eur J Oral Sci, 115*, 180-185.

Branson, BG, Black, MA, & Simmer-Beck, M. (2010). Changes in posture: A case study of a dental hygienist's use of magnification loupes. *Work 35*, 467–476.

Breedlove, SM, Rosenzweig, MR, & Watson, NV. (2007). *Biological psychology: An introduction to behavioral, cognitive, and clinical neuroscience*.

Brown, KW, & Ryan, RM. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822–848.

Brown, NJL, Sokal, AD, & Friedman, HL. (2013). The complex dynamics of wishful thinking the critical positivity ratio. *American Psychologist, 68*(9).

Brulé, G, & Veenhoven, R. (2014). Participatory teaching and happiness: In developed nations. *Journal Advances in Applied Sociology, 4*, 235-245. doi: 10.4236/aasoci.2014.411028

Brulé, Gl, & Veenhoven, R. (2014). Average happiness and dominant family type in regions in western europe around 2000. *Advances in Applied Sociology, 4*, 271-288.

Bryan, T, & Bryan, J. (2001). Positive mood and math performance. *Journal of Learning Disabilities*.

Burke, FJ, Main, JR, & Freeman, R. (1997). The practice of dentistry: An assessment of reasons for premature retirement. *Br Dent J, 182*(7), 250-254.

Butler, EA, Egloff, B, Wilhelm, FH, Smith, NC, Erickson, EA, & Gross, JJ. (2003). The social consequences of expressive supression. *Emotion, 3*(1), 48-67.

Campos, JADB, & Garcia, PcPNS. (2005). A ergonomia no atendimento médico-dentário de pacientes com necessidades especiais. *Rev Port Estomatol Cir Maxilofac, 46*, 45-48.

Capaldi, CA, Dopko, RL, & Zelenski, JM. (2014). The relationship between nature connectedness and happiness: A meta-analysis. *Frontiers in Psychology, 5*(976).

Carney, DR, Cuddy, AJC, & Yap, AJ. (2010). Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *PSYCHOLOGICAL SCIENCE, 21*(10), 1363–1368.

Carochinho, JA. (2006). Estudo de adaptação e validação do ghq-12 de goldberg para a língua portuguesa e considerações sobre a sua utilização em estudos ocupacionais. *Actas da xi conferência internacional - avaliação psicológica: Formas e contextos* (pp. 257-267).

Castelar, JV. (2006). *Una introduccion a la psicofisiologia clínica*. Madrid: Ediciones Pirâmide.

Catalino, LI, Algoe, SB, & Fredrickson, BL. (2014). Prioritizing positivity: An effective approach to pursuing happiness? *Emotion, 14*(6), 1155–1161.

Catalino, LI, & Fredrickson, BL. (2011). A tuesday in the life of a flourisher: The role of positive emotional reactivity in optimal mental health. *Emotion, 11*(4), 938–950.

Cherniack, MG, Dussetschleger, J, & Bjor, B. (2010). Musculoskeletal disease and disability in dentists. *Work, 35*, 411- 418.

Cheung, TTL, Gillebaart, M, Kroese, F, & Ridder, DD. (2014). Why are people with high self- control happier? The effect of trait self-control on happiness as mediated by regulatory. *Frontiers in Psychology, 5*(722).

Cohen, S, Kamarck, T, & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*, 385-396.

Cohn, MA, Brown, SL, Fredrickson, BL, Mikels, JA, & Conway, AM. (2009). Happiness unpacked: Positive emotions increase life satisfaction by building resilience. *Emotion, 9*(3), 361-368.

Cohn, MA, & Fredrickson, BL. (2010). In search of durable positive psychology interventions: Predictors and consequences of long-term positive behavior change. *J Posit Psychol., 5*(5), 355–366.

Cooper, C, Bebbington, P, King, M, Jenkins, R, Farrell, M, Brugha, T, McManus, S, Stewart, R, & Livingston, G. (2011). Happiness across age groups: Results from the 2007 national psychiatric morbidity survey. *Int J Geriatr Psychiatry, 26*, 608–614.

Cooper, C, Watts, J, & Kelly, M. (1987). Job satisfaction, mental health, and job stressors among general dental practitioners in the uk. *British Dental Journal, 162*(2), 77-81.

Cooper, CL, Watts, J, Jr, AJB, & Kelly, M. (1988). Occupational stress amongst general practice dentists. *Journal of Occupational Psychology, 61*, 163-174.

Corson, K, Doak, MN, Denneson, L, Crutchfield, M, Soleck, G, Dickinson, KC, Gerrity, MS, & Dobscha, SK. (2011). Primary care clinician adherence toguidelines for the management of chronic musculoskeletal pain:

Results from the study of the effectiveness of a collaborative approach to pain. *Pain Medicine, 12*, 1490–1501.

Costa, MLH. (2011). *Stress docente e hábitos de vida.* (Mestrado), Universidade de Lisboa, Lisboa.

Crompton, R, & Lyonette, C. (2011). Women's career success and work-life adaptations in the accountancy and medical professions. *Gender, Work and Organization, 18*(2).

Cropanzano, R, & Wright, TA. (2001). When a "happy" worker is really a "productive" worker: A review and further refinement of the happy - productive worker thesis. *Consulting Psychology Journal: Practice and Research, 53*(3), 182-199.

Csikszentmihaly, M, & Hunter, J. (2003). Happiness in everyday life: The use of experience sampling. *Journal of Happiness Studies, 4*, 185–199.

Csikszentmihalyi, M. (2002). *Flow*. London: Rider.

Cuddy, AJC, Wilmuth, CA, & Carney., DR. (2012). The benefit of power posing before a high-stakes social evaluation. *Harvard Business School Working Paper, 13*(027).

Dahlin, M, Joneborg, N, & Runeson, B. (2007). Performance-based self-esteem and burnout in a cross-sectional study of medical students. *Medical Teacher, 29*, 43-48.

Damásio, A. (2000). *O sentimento de si - o corpo, a emoção e a neurobiologia da consciência*. Mem Martins Portugal: Publicações Europa América, Lda.

Damásio, A. (2003). *Ao encontro de espinosa. As emoções sociais e a neurologia do sentir*. Mem Martins.

Damásio, A. (2010). *O livro da consciência - a construção do cérebro consciente* Temas e Debates -

Dambrun, M, & Dubuy, A-L. (2014). A positive psychology intervention among long-term unemployed people and its effects on psychological distress and well-being. *Journal of employment counseling, 51*.

Dambrun, M, & Ricard, M. (2011). Self-centeredness and selflessness: A theory of self-based psychological functioning and its consequences for happiness. *Review of General Psychology, 15*(2), 138-157.

Dambrun, M, Ricard, M, Després, G, Drelon, E, Gibelin, E, Gibelin, M, Loubeyre, M, Py, D, Delpy, A, Garibbo, C, Bray, E, Lac, G, & Michaux, O. (2012). Measuring happiness: From fluctuating happiness to authentic-durable happiness. *Frontiers in Psychology, 3*(16).

Damsgard, E, Dewar, A, Røe, C, & Hamran, T. (2011). Staying active despite pain: Pain beliefs and experiences with activity-related pain in patients with chronic musculoskeletal pain. *Scand J Caring, 25*, 108–116.

Davidson, RJ. (2010). Empirical explorations of mindfulness: Conceptual and methodological conundrums. *Emotion, 10*(1), 8-11.

Davidson, RJ. (2011). Mind-brain-body interaction and meditation. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind´s own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 47-54). Oakland, CA USA: New Harbinger Publications, Inc.

Davidson, RJ, & Begley, S. (2013). *The emotional life of your brain*. England: Plume.

Davidson, RJ, Jackson, DC, & Kalin, NH. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin, 126*(6), 890-909.

Davidson, RJ, & McEwen, BS. (2012). Social influences on neuroplasticity: Stress and interventions to promote well-being. *Nature Neuroscience, 15*(5), 689-695.

Davidson, RJ, & Schuyler, BS. (2015). Neuroscience of happiness. In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2015* (pp. 91-108).

Dean, SG, Hudson, S, Hay-Smith, EJC, & Milosavljevic, S. (2011). Rural workers' experience of low back pain: Exploring whythey continue to work. *J Occup Rehabil, 21*, 395-409.

DeJonge, T, Veenhoven, R, & Arends, L. (2014). "Very happy" is not always equally happy: On the meaning of verbal response options in survey questions. *Journal of Happiness Studies, 16*(1), 77-101. doi: 10.1007/s10902-013-9497-9

DeJonge, T, Veenhoven, R, Kalmijn, W, & Arends, L. (2015). Pooling time series based on slightly different questions about the same topic forty years of survey research on happiness and life satisfaction in the netherlands. *Soc Indic Res, Online*. doi: 10.1007/s11205-015-0898-5

Descatha, A, Roquelaure, Y, Chastang, J-F, Evanoff, B, Melchior, M, Mariot, C, Ha, C, Imbernon, E, Goldberg, M, & Leclerc, A. (2007). Validity of nordic-style questionnaires in the surveillance of upper-limb work-related musculoskeletal disorders. *Scand J Work Environ Health, 33*(1), 58-65.

Detweiler-Bedell, JB, & Salovey, P. (2003). Striving for happiness or fleeing from sadness? Motivating mood repair using differentially framed messages *Journal of Social and Clinical Psychology, 22*(6), 627-664.

Dias, RdS, Ramos, CC, Kerr-Corrêa, F, Trinca, LA, Cerqueira, ATdAR, Dalben, I, & Moreno, RA. (2002). Adaptação para o português do questionário de auto-avaliação de percepção de saúde física e mental da mulher de meia-idade – questionário da saúde da mulher. *Rev. Psiq. Clín., 29*(4), 181-189.

Diener, E. (2006). Guidelines for national indicators of subjective well-being and ill-being. *Journal of Happiness Studies, 7*, 397-404.

Diener, E, & Diener, C. (1996). Most people are happy. *PSYCHOLOGICAL SCIENCE, 7*(3).

Diener, E, Emmons, RA, Larsen, RJ, & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1).

Diener, E, Ng, W, Harter, J, & Arora, R. (2010). Wealth and happiness across the world: Material prosperity predicts life evaluation, whereas psychosocial prosperity predicts positive feeling. *Journal of Personality and Social Psychology, 99*(1), 52-61.

Diener, E, & Oishi, S. (2005). The nonobvious social psychology of happiness. *Psychological Inquiry, 16*(4), 162-167.

Diener, E, & Seligman, MEP. (2002). Very happy people. *American Psychological Society, 13*(1).

Diener, E, & Seligman, MEP. (2004). Beyond money: Toward an economy of well-being. *American Psychological Society, 5*(1).

Diener, E, Suh, EM, Lucas, RE, & Smith, HL. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin, 125*(2), 276-302.

Diener, E, Wirtz, D, Tov, W, Kim-Prieto, C, Choi, D-w, Oishi, S, & Biswas-Diener, R. (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Soc Indic Res, 97*, 143-156.

DiMatteo, MR, Shugars, DA, & Hays, RD. (1993). Occupational stress, life stress and mental health among dentists. *Journal of Occupational and Organizational Psychology, 66*, 153-162.

Disner, SG, Beevers, CG, Haigh, EAP, & Beck, AT. (2011). Neural mechanisms of the cognitive model of depression. *Nature Reviews Neuroscience, 12*, 467 - 477.

Dogan, SK, Saime Ay, A, Evcik, D, Kurtais, Y, & Öztuna, DG. (2012). The utility of faces pain scale in a chronic musculoskeletal pain model. *Pain Medicine, 13*, 125–130.

Downs, A, & Ashton, J. (2011). Vigorous physical activity, sports participation, and athletic identity: Implications for mental and physical health in college students. *Journal of Sport Behavior, 34*(3).

Droeze, EH, & Jonsson, H. (2005). Evaluation of ergonomic interventions to reduce musculoskeletal disorders of dentists in the netherlands. *Work 25*, 211–220.

Duarte, F, & Serranheira, F. (2015). Prevalência de sintomas associados a lesões musculoesqueléticas na atividade profissional dos higienistas orais. *Rev Port Saúde Pública, in Press*.

Dunn, EW, Aknin, LB, & Norton, MI. (2008). Spending money on others promotes happiness. *Science, 319*, 1687-1688.

Durand, M, & Smith, C. (2013). The oecd approach to measuring subjective well-being. In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2013* (pp. 112-137).

Dyrbye, LN, Thomas, MR, & Shanafelt, TD. (2006). Systematic review of depression, anxiety, and other indicators of psychological distress among us and canadian medical students. *Academic Medicine, 81*(4).

Dyrdal, GM, Roysamb, E, Nes, RB, & Vitterso, J. (2011). Can a happy relationship predict a happy life? A population-based study of maternal well-being during the life transition of pregnancy, infancy, and toddlerhood. *J Happiness Stud, 12*, 947-962.

Easterbrook, JA. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66*(3), 183-201.

Easterlin, RA. (1995). Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior and Organization, 27*, 35-47.

Ekman, P, & Goleman, D. (2008). *Emotional awareness: Overcoming the obstacles to psychological balance and compassion* (P. Ekman Ed. 1ª ed.). New York: Times Books - Henry Holt and Company, LLC.

Esteves, MdROM. (2010). *Desconforto subjectivo e regulação emocional nos estudantes de medicina dentária em portugal.* (Mestrado Psicologia das Emoções), ISCTE-IUL, Lisboa. (http://hdl.handle.net/10071/2623)

Eysenck, W, & Keane, MT. (2000). Cognition and emotion *Cognitive psychology: A student's handbook* (4th ed.).

Faria, J. (2011). *Estudo das lesões musculo-esqueléticas em estudantes de medicina dentária- uma aborgadem ergonómica.* (Mestrado Integrado), FMDUL, Lisboa.

Feng, B, Liang, Q, Wang, Y, Andersen, LL, & Szeto, G. (2014). Prevalence of work-related musculoskeletal symptoms of the neck and upper extremity among dentists in china. *BMJ Open, 4*(4), 1-8.

Fernández-Abascal, EG. (2009a). *Emociones positivas*. Madrid: Ediciones Pirámide.

Fernández-Abascal, EG. (2009b). Emociones positivas, psicología positiva y bienestar *Emociones positivas*: Ediciones Pirámide.

Ferrarelli, F, Smith, R, Dentico, D, Riedner, BA, Zennig, C, Benca, RM, Lutz, A, Davidson, RJ, & Tononi, G. (2013). Experienced mindfulness meditators exhibit higher parietal-occipital eeg gamma activity during nrem sleep. *PLoS One, 8*(8).

Fischer, SL, Marshall, MM, & Woodcock, K. (2012). Musculoskeletal disorders in sign language interpreters: A systematic review and conceptual model of musculoskeletal disorder development. *Work, 42*, 173–184.

Fisher, R, & Shapiro, D. (2006). *Beyond reason: Using emotions as you negotiate*. New York: Penguin Group.

Fonseca, R, & Serranheira, F. (2006). Sintomatologia musculoesquelética auto-referida por enfermeiros em meio hospitalar. *Volume Temático, 6*.

Fortin, N, Helliwell, JF, & Wang, S. (2015). How does subjective well-being vary around the world by gender and age? In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2015* (pp. 45-79).

Frasquilho, MA. (2005). Medicina, uma jornada de 24 horas? Stress e burnout em médicos: Prevenção e tratamento. *Saúde Mental, 23*(2).

Fredrickson, BL. (1998). What good are positive emotions? *Review of General Psychology, 2*(3), 300-319.

Fredrickson, BL. (2004). Gratitude, like other positive emotions, broadens and builds. In R. A. Emmons & M. E. McCullough (Eds.), *The psychology of gratitude* (pp. 145-166). New York: NY: Oxford University Press.

Fredrickson, BL. (2010). *Positividade* (1ª ed.). Lisboa: Sinais de Fogo - Publicações, L^{da}.

Fredrickson, BL, & Branigan, C. (2005). Positive emotions broaden the scope of attention and thoughtaction repertoires. *Cogn Emot, 19*(3), 313–332.

Fredrickson, BL, Coffey, KA, Pek, J, Cohn, MA, & Finkel, SM. (2008). Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. *Journal of Personality and Social Psychology, 95*(5), 1045–1062.

Fredrickson, BL, Grewen, KM, Coffey, KA, Algoe, SB, Firestine, AM, Arevalo, JMG, Ma, J, & Cole, SW. (2013). A functional genomic perspective on human well-being. *PNAS, 10*(33), 13684–13689.

Fredrickson, BL, & Joiner, T. (2002). Positive emotions trigger upward spirals toward emotional well-being. *American Psychological Society, 13*(2).

Fredrickson, BL, & Losada, MF. (2005). Positive affect and the complex dynamics of human flourishing. *American Psychologist, 60*(7), 678–686.

Gable, SL, Impett, EA, Reis, HT, & Asher, ER. (2004). What do you do when things go right? The intrapersonal and interpersonal benefits of sharing positive events. *Journal of Personality and Social Psychology, 87*(2), 228-245.

Galinha, IC, & Ribeiro, JLP. (2005a). Contribuição para o estudo da versão portuguesa da positive and negative affect schedule (panas): I -

abordagem teórica ao conceito de afecto. *Análise Psicológica, 2*(XXIII), 209-218.

Galinha, IC, & Ribeiro, JLP. (2005b). Contribuição para o estudo da versão portuguesa da positive and negative affect schedule (panas): Ii - estudo psicométrico. *Análise Psicológica, 2*(XXIII), 219-227.

Gallo, IS, McCulloch, KC, Keil, A, Rockstroh, B, & Gollwitzer, PM. (2009). Strategic automation of emotion regulation. *Journal of Personality and Social Psychology, 96*(1), 11-31.

Gana, K, Bailly, N, Saada, Y, Joulain, M, Trouillet, R, Hervé, C, & Alaphilippe, D. (2013). Relationship between life satisfaction and physical health in older adults: A longitudinal test of cross-lagged and simultaneous effects. *Health Psychology, 32*(8), 896–904.

Garland, EL, Gaylord, SA, & Fredrickson, BL. (2011). Positive reappraisal mediates the stress-reductive effects of mindfulness: An upward spiral process. *Mindfulness*.

Gaspar, A. (2014). Neurobiologia e psicologia da empatia pntos de partida para a investigação e intervenção da promoção da empatia. 27-42.

Gerschman, JA. (1998). Stress and distress in dentistry. *Stress Medicine, 14*, 213-217.

Glaser, R, & Kiecolt-Glaser, JK. (2005). Stress-induced immune dysfunction: Implications for health. *Nature Reviews | Immunology, 5*, 243-251.

Goebert, D, Thompson, D, Takeshita, J, Beach, C, Bryson, P, Ephagrave, K, Kent, A, Kunkel, M, Schechter, J, & Tate, J. (2009). Depressive symptoms in medical students and residents: A multischool study. *Academic Medicine, 84*(2).

Goldberg, DP, Gater, R, Sartorius, N, Ustun, TB, Piccinelli, M, Gureje, O, & Rutter, C. (1997). The validity of two versions of the ghq in the who study of mental illness in general health care. *Psychological Medicine, 27*, 191-197.

Gorter, R, Freeman, R, Hammen, S, Murtomaa, H, Blinkhorn, A, & Humphris, G. (2008). Psychological stress and health in undergraduate dental students: Fifth year outcomes compared with first year baseline results from five european dental schools. *Eur J Dent Educ, 12*, 61-68.

Gorter, RC, Albrecht, G, Hoogstraten, J, & Eijkman, MA. (1998). Work place characteristics, work stress and burnout among dutch dentists. *Eur J Oral Sci, 106*(6), 999-1005.

Gorter, RC, Albrecht, G, Hoogstraten, J, & Eijkman, MA. (1999). Measuring work stress among dutch dentists. *Int Dent J, 49*(3), 144-152.

Gorter, RC, Eijkman, MAJ, & Hoogstraten, J. (2000). Burnout and health among dutch dentists. *Eur J Oral Sci, 108*, 261-267.

Graça, CC, Araújo, TnM, & Silva, CEP. (2006). Desordens musculoesqueléticas em cirurgiões-dentistas. *Sitientibus Feira de Santana, 34*(Jan / Jun), 71- 86.

Greenberg, L. (2008). Emotion and cognition in psychotherapy: The transforming power of affect. *Canadian Psychology, 49*(1), 49-59.

Griffiths, KL, Mackey, MG, & Adamson, BJ. (2011). Behavioral and psychophysiological responses to job demands and association with musculoskeletal symptoms in computer work. *J Occup Rehabil, 21*, 482–492.

Grinde, B. (2005). An approach to the prevention of anxiety-related disorders based on evolutionary medicine. *Preventive Medicine, 40*, 904-909.

Grinde, B. (2012). An evolutionary perspective on happiness and mental health. *The Journal of Mind and Behavior, 33*(1 and 2), 49-68.

Gross, JJ. (2008). Emotion regulation. In M. Lewis, J. M. Haviland-Jones, & L. F. Barret (Eds.), *Handbook of emotion* (pp. 497-512). New York: The Guilford Publications.

Gross, JJ, & John, OP. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*(2), 348-362.

Gross, JJ, Sutton, SK, & Ketelaar, T. (1998). Relations between affect and personality: Support for the affect-level and affective-reactivity views. *Personality & Social Psychology Bulletin*(24), 3.

Gross, JJ, & Thompson, RA. (2007). Emotion regulation conceptual foundations *Handbook of emotion regulation* (pp. 3-24).

Groter, R, Freeman, R, Hammen, S, Murtomaa, H, Blinkhorn, A, & Humphris, G. (2008). Psychological stress and health in undergraduate dental students: Fifth year outcomes compared with first year baseline results from five european dental schools. *European Journal of Dental Education, 12*(2), 61-68.

Gruber, J. (2011). Can feeling too good be bad? Positive emotion persistence (pep) in bipolar disorder. *Current Directions in Psychological Science, 20*(4), 217-221.

Gruber, J, Eidelman, P, Johnson, SL, Smith, B, & Harvey, AG. (2011). Hooked on a feeling: Rumination about positive and negative emotion in inter-episode bipolar disorder. *J Abnorm Psychol, 120*(4), 956–961.

Gruber, J, Harvey, AG, & Johnson, SL. (2009). Reflective and ruminative processing of positive emotional memories in bipolar disorder and healthy controls. *Behav Res Ther, 47*(8), 697–704.

Gruber, J, Kogan, A, Quoidbach, J, & Mauss, IB. (2013). Happiness is best kept stable: Positive emotion variability is associated with poorer psychological health. *Emotion, 13*(1), 1–6.

Gruber, J, Mauss, IB, & Tamir, M. (2011). A dark side of happiness? How, when, and why happiness is not always good. *Perspectives on Psychological Science, 6*(3), 222–233.

Guilford, JP, & Frunchter, B. (1978). *Fundamental statistics in psychology and education*. Singapore: Singapore: McGraw-Hill Book Co.

Gupta, A, Ankola, AV, & Hebbal, M. (2013). Dental ergonomics to combat musculoskeletal disorders: A review. *International Journal of Occupational Safety and Ergonomics, 19*(4), 561–571.

Guthrie, EA, Black, D, Shaw, CM, Hamilton, J, Creed, FH, & Tomenson, B. (1997). Psychological stress in medical students: A comparison of two very different university courses. *Stress Medicine, 13*(3), 179-184.

Hagen, K, Linde, M, Heuch, I, Stovner, LJ, & Zwart, J-A. (2011). Increasing prevalence of chronic musculoskeletal complaints. A large 11-year follow-up in the general population (hunt 2 and 3). *Pain Medicine, 12*, 1657–1666.

Hartfiel, N, Burton, C, Rycroft-Malone, J, Clarke, G, Havenhand, J, Khalse, S, & Edwards, R. (2012). Yoga for reducing perceived stress and back pain at work. *Occup Med (Lond), 62*(8), 606-612.

Harutunian, K, Gargallo-Albiol, J, Figueiredo, R, & Gay-Escoda, C. (2011). Ergonomics and musculoskeletal pain among postgraduate students and faculty members of the school of dentistry of the university of barcelona (spain). A cross-sectional study. *Med Oral Patol Oral Cir Bucal, 16*(3), e425-429.

Harvill, LM. (1986). Test anxiety in first-year medical students. *Journal of Medical Education, 61*.

Hayes, M, Cockrell, D, & Smith, D. (2009). A systematic review of musculoskeletal disorders among dental professionals. *Int J Dent Hygiene, 7*(3), 159–165.

Heller, AS, Johnstone, T, Light, S, Peterson, MJ, Kolden, GG, Kalin, NH, & Davidson, RJ. (2013). Relationships between changes in sustained fronto-striatal connectivity and positive affect with antidepressant treatment in major depression. *Am J Psychiatry., 170*(2), 197–206.

Heller, AS, Johnstone, T, Shackmana, AJ, Lighta, SN, Peterson, MJ, Kolden, GG, Kalin, NH, & Davidson, RJ. (2009). Reduced capacity to sustain positive emotion in major depression reflects diminished maintenance of fronto-striatal brain activation. *PNAS, 106*(52), 22445–22450.

Heller, AS, Lapate, RC, Mayer, K, & Davidson, RJ. (2014). The face of negative affect: Trial-by-trial corrugator responses to negative pictures are positively associated with amygdala and negatively associated with ventromedial prefrontal cortex activity. *J Cogn Neurosci., 26*(9), 2102–2110.

Heller, AS, Reekum, CMv, Schaefer, SM, Lapate, RC, Radler, BT, Ryff, CD, & Davidson, RJ. (2013). Sustained striatal activity predicts eudaimonic well-being and cortisol output. *Psychol Sci., 24*(11).

Helliwell, JF, Huang, H, & Wang, S. (2015). The geography of world happiness. In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2015* (pp. 15-44).

Helliwell, JF, Layard, R, & Sachs, J. (2015). Setting the stage. In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2015* (pp. 5-14).

Helliwell, JF, Layard, R, & Sachs, JD. (2013). Introduction. In J. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2013* (pp. 3-8).

Hill, MM, & Hill, A. (2012). *Investigação por questionário*. Lisboa.

Hirsch, JK, Duberstein, PR, & Unutzer, J. (2009). Chronic medical problems and distressful thoughts of suicide in primary care patients: Mitigating role of happiness. *Int J Geriatr Psychiatry, 24*, 671- 679.

Hjemdal, O, Friborg, O, & Stiles, TC. (2012). Resilience is a good predictor of hopelessness even after accounting for stressful life events, mood and personality (neo-pi-r). *Scandinavian Journal of Psychology, 53*, 174-180.

Hofmann, SG, Grossman, P, & Hinton, DE. (2011). Loving-kindness and compassion meditation: Potential for psychological interventions. *Clin Psychol Rev, 31*(7), 1126–1132.

Holmgren, K, Fjällström-Lundgren, M, & Hensing, G. (2013). Early identification of work-related stress predicted sickness absence in employed women with musculoskeletal or mental disorders: A prospective, longitudinal study in a primary health care setting. *Disability & Rehabilitation, 35*(5), 418–426.

Holosko, MJ, & Thyer, BA. (2011). *Pocket glossary for commonly used research terms*. Thousand Oaks, California: SAGE Publications, Inc.

Holzel, BK, Carmody, J, Evans, KC, Hoge, EA, Dusek, JA, Morgan, L, Pitman, RK, & Lazar, SW. (2010). Stress reduction correlates with structural changes in the amygdala. *SCAN, 5*, 11-17.

Howell, RT, Chenot, D, Hill, G, & Howell, CJ. (2011). Momentary happiness: The role of psychological need satisfaction. *J Happiness Stud, 12*, 1-15.

Hsee, CK, Yang, Y, Li, N, & Shen, L. (2009). Wealth, warmth, and well-being: Whether happiness is relative or absolute depends on whether it is about money, acquisition, or consumption. *Journal of Marketing Research, XLVI*, 396–409.

Hu, LW, Gorenstein, C, & Fuentes, D. (2007). Portuguese version of corah's dental anxiety scale: Transcultural adaptation and reliability analysis. *Depression Anxiety, 24*, 467-471.

Humphris, G, Blinkhorn, A, Freeman, R, Gorter, R, Hoad-Reddick, G, Murtomaa, H, O'Sullivan, R, & Splieth, C. (2002). Psychological stress in undergraduate dental students: Baseline results from seven european dental schools. *Eur J Dent Educ, 6*, 22-29.

Ifcher, J, & Zarghamee, H. (2014). Affect and overconfidence: A laboratory investigation. *Journal of Neuroscience, Psychology, and Economics, 7*(3), 125–150.

Jacobs, TL, Epel, ES, Lin, J, Blackburn, EH, Wolkowitz, OM, Bridwell, DA, Zanesco, AP, Aichele, SR, Sahdra, BK, MacLean, KA, King, BG, Shaver, PR, Rosenberg, EL, Ferrer, E, Wallace, BA, & Saron, CD. (2010). Intensive meditation training,immune cell telomerase activity, and psychological mediators. *J. Psyneuen.*, 18.

Jacobs, TL, Shaver, PR, Epel, ES, Zanesco, AP, Aichele, SR, Bridwell, DA, Rosenberg, EL, King, BG, MacLean, KA, Sahdra, BK, Kemeny, ME, Ferrer, E, Wallace, BA, & Saron, CD. (2013). Self-reported mindfulness and cortisol during a shamatha meditation retreat. *Health Psychology, 32*(10), 1104-1109.

Javaras, KN, Schaefer, SM, Reekum, CMv, Lapate, RC, Greischar, LL, Bachhuber, DR, Love, GD, Ryff, CD, & Davidson, RJ. (2012). Conscientiousness predicts greater recovery from negative emotion. *Emotion, 12*(5), 875-881.

Jayawickreme, E, Forgeard, MJC, & Seligman, MEP. (2012). The engine of well-being. *Review of General Psychology, 16*(4), 327–342.

John, OP, & Gross, JJ. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality 72*(6).

Johnson, W, & Krueger, RF. (2006). How money buys happiness: Genetic and environmental processes linking finances and life satisfaction. *Journal of Personality and Social Psychology, 90*(4), 680–691.

Jonh, OP, & Gross, JJ. (2007). Individual differences in emotion regulation *Handbook of emotion regulation* (pp. 351-372).

Kabat-Zinn, J. (2011). Some clinical applications of mindfulness meditation in medicine and psychiatry: The case of mindfulness-based stress reduction. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind´s own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 35-46). Oakland, CA USA: New Harbinger Publications, Inc.

Kabat-Zinn, J, & Davidson, R. (2011). *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (1st ed.). Oakland, CA USA: New Harbinger Publications, Inc.

Kaliman, P, Álvarez-López, MJ, Cosín-Tomás, M, Rosenkranz, MA, Lutz, A, & Davidson, RJ. (2014). Rapid changes in histone deacetylases and inflammatory gene expression in expert meditators. *J. Psyneuen., 40*, 96-107.

Kang, Y, & Gruber, J. (2013). Harnessing happiness? Uncontrollable positive emotion in bipolar disorder, major depression, and healthy adults. *Emotion, 13*(2).

Kashdan, TB. (2007). New developments in emotion regulation with and emphasis on the positive spectrum of human functioning *Journal of Happiness Studies, 8*, 303–310.

Kawada, T, & Otsuka, T. (2012). Psychological well-being using the 12-item general health questionnaire (ghq12) and age in japanese working men. *Journal of Psychiatric and Mental Health Nursing, 19*, 758–760.

Kemeny, ME, Foltz, C, Cavanagh, JF, Cullen, M, Giese-Davis, J, Jennings, P, Rosenberg, EL, Gillath, O, Shaver, PR, Wallace, BA, & Ekman, P. (2011). Contemplative/emotion training reduces negative emotional behavior and promotes prosocial responses. *Emotion*.

Kemeny, ME, & Shestyuk, A. (2008). Emotions, the neuroendocrine and immune system, and health *Handbook of emotion* (pp. 661-675).

Kern, ML, Eichstaedt, JC, Schwartz, HA, Gregory Park, Ungar, LH, Stillwell, DJ, Kosinski, M, Dziurzynski, L, & Seligman, MEP. (2014). From “sooo excited!!!” to “so proud”: Using language to study development. *Developmental Psychology, 50*(1), 178–188.

Keyes, CLM. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *American Psychologist, 62*(2), 95-108.

Keyes, CLM, Shmotkin, D, & Ryff, CD. (2002). Optimizing well-being: The empirical encounter of two traditions. *Personality and Social Psychology, 82*(6), 1007–1022.

Khang, Y-H, & Kim, HR. (2010). Gender differences in self-rated health and mortality association: Role of pain-inducing musculoskeletal disorders. *Journal of Women’s Health, 19*(1).

Kierklo, A, Kobus, A, Jaworska, M, & Botuliński, B. (2011). Work-related musculoskeletal disorders among dentists - a questionnaire survey. *Ann Agric Environ Med, 18*, 79–84.

Klimecki, OM, Leiberg, S, Lamm, C, & Singer, T. (2013). Functional neural plasticity and associated changes in positive affect after compassion training. *Cerebral Cortex, 23*, 1552-1561.

Klimecki, OM, Leiberg, S, Ricard, M, & Singer, T. (2014). Differential pattern of functional brain plasticity after compassion and empathy training. *Soc Cogn Affect Neurosci 9*(6), 873-879.

Knapp, P, & Beck, AT. (2008). Fundamentos, modelos conceituais, aplicaçoes e pesquisa da terapia cognitiva cognitive therapy: Foundations, conceptual models, applications and research. *Rev Bras Psiquiatr, 30*(Supl II), 554-564.

Kobau, R, Seligman, MEP, Peterson, C, Diener, E, Zack, MM, Chapman, D, & Thompson, W. (2011). Mental health promotion in public health: Perspectives and strategies from positive psychology. *American Journal of Public Health, 101*(8).

Kok, BE, Coffey, KA, Cohn, MA, Catalino, LI, Vacharkulksemsuk, T, Algoe, SB, Brantley, M, & Fredrickson, BL. (2013). How positive emotions build physical health: Perceived positive social connections account for the upward spiral between positive emotions and vagal tone. *Psychol Sci., 24*(7), 1123–1132.

Kok, BE, & Fredrickson, BL. (2013). How positive emotions broaden and build. *Positive Emotion*.

Kok, BE, Waugh, CE, & Fredrickson, BL. (2013). Meditation and health: The search for mechanisms of action. *Social and Personality Psychology Compass, 7*(1), 27-39.

Kruse, E, Chancellor, J, Ruberton, PM, & Lyubomirsky, S. (2014). An upward spiral between gratitude and humility. *Social Psychological and Personality Science*, 1-10.

Kumar, DK, Rathan, N, Mohan, S, Begum, M, Prasad, B, & Prasad, ERV. (2014). Exercise prescriptions to prevent musculoskeletal disorders in dentists. *Journal of Clinical and Diagnostic Research, 8*(7), ZE13-ZE16.

Kuorinka, I, Jonsson, B, Kilbom, A, Vinterberg, H, Biering-Sorensen, F, Andersson, G, & Jorgensen, K. (1987). Standardised nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied Ergonomics, 18*(3), 233-237.

Kuppens, P, Realo, A, & Diener, E. (2008). The role of positive and negative emotions in life satisfaction judgment across nations. *Journal of Personality and Social Psychology, 95*(1), 66-75.

Kurtz, JL, & Lyubomirsky, S. (2013). Using mindful photography to increase positive emotion and appreciation. *Happiness Promotion*.

Lacey, HP, Kierstead, TA, & Morey, D. (2012). De-biasing the age-happiness bias: Memory search and cultural expectations in happiness judgments across the lifespan. *J Happiness Stud, 13*, 647–658.

Langballe, EM, Innstrand, ST, Hagtvet, KA, Falkuma, E, & Aaslande, OG. (2009). The relationship between burnout and musculoskeletal pain in seven norwegian occupational groups. *Work, 32*, 179–188.

Laranjeira, CA. (2008). General health questionnaire-12 items: Adaptation study to the portuguese population. *Epidemiologia e Psichiatria Sociale, 17*(2).

Layard, R. (2005). *Happiness: Lessons from a new science*. USA: Penguin Books.

Layard, R, Clark, A, & Senik, C. (2012). The causes of happiness and misery. In J. F. Helliwell, R. Layard, & J. D. Sachs (Eds.), *World happiness report 2012* (pp. 58-89).

Layard, R, & O'Donnell, G. (2015). How to make policy when happiness is the goal. In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), *World happiness report 2015* (pp. 79-90).

Layous, K, Chancellor, J, & Lyubomirsky, S. (2014). Positive activities as protective factors against mental health conditions. *Journal of Abnormal Psychology, 123*(1), 3–12.

Layous, K, Chancellor, J, Lyubomirsky, S, Wang, L, & Doraiswamy, PM. (2011). Delivering happiness: Translating positive psychology intervention research for treating major and minor depressive disorders. *The Journal of Alternative and Complementary Medicine, 17*(8), 675–683.

Layous, K, Nelson, SK, Oberle, E, Schonert-Reichl, KA, & Lyubomirsky, S. (2012). Kindness counts: Prompting prosocial behavior in preadolescents boosts peer acceptance and well-being. *PLoS ONE, 7*(12).

Le, TN. (2010). Life satisfaction, openness value, self-transcendence, and wisdom. *Springer Online Publication*.

LeDoux, J. (2000). *O cérebro emocional: As misteriosas estruturas da vida emocional*. Cascais: Pregaminho Lda.

Lee, E-KO, Yoon, H, Lee, J, Yoon, J, & Chang, E. (2012). Body-mind-spirit practice for healthy aging. *Educational Gerontology, 38*, 473-485.

Lee, H, Wilbur, J, Kim, MJ, & Miller, AM. (2008). Psychosocial risk factors for work-related musculoskeletal disorders of the lower-back among long-haul international female flight attendants. *Journal of Advanced Nursing, 61*(5), 492–502.

Lee, Y-C, Lin, Y-C, Huang, C-L, & Fredrickson, BL. (2013). The construct and measurement of peace of mind. *J Happiness Stud, 14*, 571–590.

Leggat, P, & Smith, D. (2006). Musculoskeletal disorders self-reported by dentists in queensland, australia. *Australian Dental Journal, 51*(4), 324-327.

Leite, ES, & Uva, AdS. (2010). *Stress e imunidade*. Lisboa: Sociedade Portuguesa de Medicina do trabalho.

Lert, F, Chastang, JF, & Castano, I. (2001). Psychological stress among hospital doctors caring for hiv patients in the late nineties. *AIDS Care, 13*(6), 763-778.

Lesage, F-X, Martens-Resende, S, Deschamps, F, & Berjot, S. (2011). Validation of the general health questionnaire (ghq-12) adapted to a work-related context. *Open Journal of Preventive Medicine, 1*(2), 44-48.

Levenson, RW, Ekman, P, & Ricard, M. (2012). Meditation and the startle response: A case study. *Emotion, 12*(3).

Levinson, DB, Smallwood, J, & Davidson, RJ. (2012). The persistence of thought: Evidence for a role of working memory in the maintenance of task-unrelated thinking. *Psychol Sci., 23*(4), 375–380.

Lim, VKG, & Yuen, EC. (1998). Doctors, patients, and perceived job image: An empirical study and nurses in singapore. *Journal of Behavioral Medicine, 24*(3), 269-282.

Lin, J, Epel, E, Cheon, J, Kroenke, C, Sinclair, E, Bigos, M, Wolkowitz, O, Mellon, S, & Blackburn, E. (2010). Analyses and comparisons of telomerase activity and telomere length in human t and b cells: Insights for epidemiology of telomere maintenance. *J Immunol Methods, 352*(1-2), 71–80.

Lloyd, K. (2011). Health-related quality of life and children's happiness with their childcarecch. *Blackwell Publishing Ltd*.

Lopes, PN, Salovey, P, Côté, S, & Beers, M. (2005). Emotion regulation abilities and the quality of social interaction. *Emotion, 5*(1), 113-118.

Lucas, RE, Clark, AE, Georgellis, Y, & Diener, E. (2003). Reexamining adaptation and the set point model of happiness: Reactions to changes in marital status. *Journal of Personality and Social Psychology, 84*(3), 527–539.

Luciano, JV, & Algaravio, S. (2008). Thought supression confronting a reminder stimulus: An effective strategy for the management of intrusive thoughts? *Cognitive Therapy Research, 32*, 11-22.

Luft, CDB, Sanches, SdO, Mazo, GZ, & Andrade, A. (2007). Versão brasileira da escala de estresse percebido: Tradução e validação para idosos. *Rev Saúde Pública, 41*(1), 606-615.

Luís, HPS, Assunção, VA, & Luís, LFS. (2012). Tradução e validação para português de um questionário de hábitos, conhecimentos e atitudes de saú de oral dos adolescentes. *Adolescência & Saúde, 9*(1), 7-11.

Luís, LCMC. (2009). *Estudo das percepções ergonómicas em medicina dentária.* Universidade Fernando Pessoa, Porto.

Lundy-Ekman, L. (2008). *Neurociência fundamentos para a reabilitação*. Rio de Janeiro: Elsevier.

Luo, Y, Huang, X, Yang, Z, Li, B, Liu, J, & Wei, D. (2014). Regional homogeneity of intrinsic brain activity in happy and unhappy individuals. *PLOS ONE, 9*(1).

Lutz, A, Brefczynski-Lewis, J, Johnstone, T, & Davidson, RJ. (2008). Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLoS ONE, 3*(3).

Lutz, A, McFarlin, DR, Perlman, DM, Salomons, TV, & Davidson, RJ. (2013). Altered anterior insula activation during anticipation and experience of painful stimuli in expert meditators. *NeuroImage, 64*, 538-546.

Lutz, A, Slagter, HA, Dunne, JD, & Davidson, RJ. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences, xxx*(x), 7.

Lyubomirsky, S. (2011). Hedonic adaptation to positive and negative experiences. In S. Folkman (Ed.), *Oxford handbook of stress, health and coping* (pp. 200-224). New York: Oxford University Press.

Lyubomirsky, S. (2013). *The myths of happiness*. New York: Penguin Books.

Lyubomirsky, S, Boehm, JK, Kasri, F, & Zehm, K. (2011). The cognitive and hedonic costs of dwelling on achievement-related negative experiences: Implications for enduring happiness and unhappiness. *Emotion, 11*(5), 1152–1167.

Lyubomirsky, S, King, L, & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*(6), 803-855.

Lyubomirsky, S, & Layous, K. (2013). How do simple positive activities increase well-being? *Current Directions in Psychological Science, 22*(1), 57–62.

Lyubomirsky, S, & Lepper, HS. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research, 46*(2), 137.

Lyubomirsky, S, Sheldon, KM, & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. *Review of General Psychology, 9*(2), 111-131.

Lyubomirsky, S, Sousa, L, & Dickerhoof, R. (2006). The costs and benefits of writing, talking, and thinking about life's triumphs and defeats. *Journal of Personality and Social Psychology, 90*(4), 692–708.

Martin, MW. (2007). Happiness and virtue in positive psychology. *Journal for the Theory of Social Behaviour, 37*(1).

Mathews, J, & Paulose, C. (2011). The healing power of well-being. *Acta Neuropsychiatrica, 23*, 145–155.

Matsumoto, D, Yoo, SH, & Nakagawa, S. (2008). Culture, emotion regulation, and adjustment. *Journal of Personality and Social Psychology, 94*(6), 925-937.

Mauss, IB, Tamir, M, Anderson, CL, & Savino, NS. (2011). Can seeking happiness make people happy? Paradoxical effects of valuing happiness. *Emotion, 11*(4), 807–815.

McCray, LW, Cronholm, PF, Bogner, HR, Gallo, JJ, & Neil, RA. (2008). Resident physician burnout: Is ther hope? *Fam Med, 40*(9), 626-632.

McEwen, BS. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiol Rev, 87*, 873–904.

McEwen, BS, & Milner, TA. (2007). Hippocampal formation: Shedding light on the influence of sex and stress on the brain. *Brain Res Rev, 55*(2), 343–355.

Melamed, S. (2009). Burnout and risk of regional musculoskeletal pain — a prospective study of apparently healthy employed adults. *Stress and Health, 25*, 313–321.

Memarpoura, M, Badakhshb, S, Khosroshahid, SS, & Vossoughie, M. (2013). Work-related musculoskeletal disorders among iranian dentists. *Work, 43*, 465–474.

Mesquita, C. (2011). *Efeitos de um programa de exercicios na sintomatologia lombar e qualidade de vida em operários.* (PhD), Universidade do Porto, Porto.

Mesquita, CC, Ribeiro, JC, & Moreira, P. (2010). Portuguese version of the standardized nordic musculoskeletal questionnaire: Cross cultural and reliability. *J Public Health, 18*, 461–466.

Millner, UC. (2012). Positive psychology: The science of happiness and human strengths. *Psychiatric Rehabilitation Journal, 35*(4), 355–358.

Miron-Shatz, T, Diener, E, Doniger, GM, & Moore, T. (2013). Charting the internal landscape: Affect associated with thoughts about major life domains explains life satisfaction. *Judgment and Decision Making, 8*(5), 603-616.

Mohanty, MS. (2014). What determines happiness? Income or attitude: Evidence from the u.S. Longitudinal data. *Journal of Neuroscience, Psychology, and Economics, 7*(2), 80–102.

Moljord, IEO, Moksnes, UK, Eriksen, L, & Espnes, GA. (2011). Stress and happiness among.

Montasem, A, Brown, SL, & Harris, R. (2013). Do core self-evaluations and trait emotional intelligence predict subjective well-being in dental students? *Journal of Applied Social Psychology, 43*, 1097-1103.

Montgomery, AJ, Panagopolou, E, & Benos, A. (2006). Work-family interference as a mediator between job demands and job burnout among doctors. *Stress and Health, 22*, 203-212.

Moreira, JM. (2009). *Questionários: Teoria prática*. Coimbra.

Morinville, A, Miranda, D, & Gaudreau, P. (2013). Music listening motivation is associated with global happiness in canadian late adolescents. *Psychology of Aesthetics, Creativity, and the Arts, 7*(4), 384–390.

Morse, T, Bruneau, H, & Dussetschleger, J. (2010). Musculoskeletal disorders of the neck and shoulder in the dental professions. *Work 35*, 419–429.

Murphy, KR. (2006). *A critique of emotional intelligence*. New York: Lawrence Erlbaum Associates.

Myers, DG, & Diener, E. (1995). Who is happy? *American Psychological Society, 6*(1).

Myers, HL, & Myers, LB. (2004). 'It's difficult being a dentist': Stress and health in the general dental practitioner. *Br Dent J, 197*(2).

Nair, S, Sagar, M, Sollers, J, Consedine, N, & Broadbent, E. (2014). Do slumped and upright postures affect stress responses? A randomized trial. *Health Psychology, Online*, 1-10.

Nave-Leal, EDP, Pais-Ribeiro, JL, & Martins-Olveira, MJ. (2012). Happiness, hope, and affection as predictors of quality of life and functionality of individuals with heart failure at three-month follow-up. *Psychology Research, 2*(9), 532-539.

Nawijn, J, & Veenhoven, R. (2011). The effect of leisure activities on life satisfaction: The importance of holiday trips. In I. Brdar (Ed.), *The human pursuit of well-being: A cultural approach* (pp. 39-53): Springer Science.

Neidle, EA. (1984). Faculty approaches to combating professional burnout. *Journal of Dental Education, 48*(2), 86-90.

Nelson, SK, Kushlev, K, & Lyubomirsky, S. (2014). The pains and pleasures of parenting: When, why, and how is parenthood associated with more or less well-being? *Psychological Bulletin, 140*(3), 846–895.

Neto, T, Junior, LCH, Lopes, AD, Silva, R, & Jacobsohn, L. (2013). Prevalência de dor músculo-esquelética em corredores recreacionais portugueses no momento antecedente à corrida: Um estudo transversal. *Revista Portuguesa de Fisioterapia no Desporto, 7*(1).

Newall, NEG, Chipperfield, JG, Bailis, DS, & Stewart, TL. (2013). Consequences of loneliness on physical activity and mortality in older adults and the power of positive emotions. *Health Psychology, 32*(8), 921–924.

Newton, J, Luce, A, Zwanenberg, TV, & Firth-Cozens, J. (2004). Job dissatisfaction and early retirement: A qualitative study of general practioners in the northern deanery. *Primary Health Care Research and Development, 5*, 68-76.

Newton, JT, Allen, CD, Coates, J, Turner, A, & Prior, J. (2006). How to reduce the stress of general dental practice: The need for research into the effectiveness of multifaceted interventions. *British Dental Journal, 200*(8), 437-440. doi: 4813463 [pii] 10.1038/sj.bdj.4813463

Newton, JT, & Gibbons, DE. (1996). Stress in dental practice: A qualitative comparison of dentists working within the nhs and those working within an independent capitation scheme. *British Dental Journal, 180*(9).

Ng, W, & Diener, E. (2013). Daily use of reappraisal decreases negative emotions toward daily unpleasant events. *Journal of Social and Clinical Psychology, 32*(5), 530-545.

O'Connor, R, Dinan, T, & Cryan, J. (2012). Little things on which happiness depends: Microrna s as novel therapeutic targets for the treatment of anxiety and depression. *Molecular Psychiatry, 17*, 359–376.

Ochsner, KN, & Gross, JJ. (2008). Cognitive emotion regulation insights from social cognitive and affective neuroscience. *Current Directions in Psychological Science, 17*(2), 153-158.

Oishi, S, Diener, E, Choi, D-W, Kim-Prieto, C, & Choi, I. (2007). The dynamics of daily events and well-being across cultures: When less is more. *Journal of Personality and Social Psychology, 93*(4), 685–698.

Okulicz-Kozaryn, A. (2011). Does religious diversity make us unhappy? *Mental Health, Religion & Culture, 14*(10), 1063–1076.

Oliver, JE, Mansell, A, & Jose, PE. (2010). A longitudinal study of the role of negative affectivity on the work stressor-strain process. *International Journal Of Stress Management, 17*(1), 56-77.

Orkibi, H, Ronen, T, & Assoulin, N. (2014). The subjective well-being of israeli adolescents attending specialized school classes. *Journal of Educational Psychology, 106*(2), 515–526.

Ostir, GV, Markides, KS, Peek, MK, & Goodwin, JS. (2001). The association between emotional well-being and the incidence of stroke in older adults. *Psychosomatic Medicine, 63*, 210–215.

Ott, JC. (2010). Happiness, economics and public policy: A critique. *J Happiness Stud, 11*, 125–130.

Paananen, M, Taimela, S, Auvinen, J, Tammelin, T, Zitting, P, & Karppinen, J. (2011). Impact of self-reported musculoskeletal pain on health-related quality of life among young adults. *Pain Medicine, 12*, 9–17.

Padrón, A, Galán, I, Durbán, M, Gandarillas, A, & Rodríguez-Artalejo, F. (2012). Confirmatory factor analysis of the general health questionnaire (ghq-12) in spanish adolescents. *Qual Life Res, 21*, 1291–1298.

Pais-Ribeiro, JL. (2012). Validação transcultural da escala de felicidade subjectiva de lyubomirsky e lepper. *Psicologia, Saúde & Doenças, 13*(2), 157-168.

Palliser, CR, Firth, HM, Feyer, AM, & Paulin, SM. (2005). Musculoskeletal discomfort and work-related stress in new zealand dentists. *Work & Stress, 19*(4), 351/359.

Panksepp, J. (1998). *Affective neuroscience: The foundation of human and animal emotions*. New York: Oxford University Press.

Park, J, Chung, S, An, H, Park, S, Lee, C, Kim, SY, Lee, J-D, & Kim, K-S. (2012). A structural model of stress, motivation, and academic performance in medical students. *Korean Neuropsychiatric Association*.

Parks, AC, Porta, MDD, Pierce, RS, Zilca, R, & Lyubomirsky, S. (2012). Pursuing happiness in everyday life: The characteristics and behaviors of online happiness seekers. *Emotion, 12*(6), 1222–1234.

Parks, AC, & Szanto, RK. (2013). Assessing the efficacy and effectiveness of a positive psychologybased self-help book. *Terapia Psicológica, 31*(1), 141-149.

Pavot, W, Diener, E, & Suh, E. (1998). The temporal satisfaction with life scale. *Journal of Personality Assessment, 70*(2), 340-354.

Peisah, C, Latif, E, Wilhelm, K, & Williams, B. (2009). Secrets to psychological sucess: Why older doctors might have lower psychological distress and burnout than younger doctors. *Aging & Mental Health, 13*(2), 300-307.

Pereira, A. (2008). *Guia prático de utilização do spss - análise de dados para ciências sociais e psicologia* (7ª ed.). Lisboa: Edições Sílabo, Lda.

Perez-Padron, M, Bernabé, E, Gomez-Santos, G, Tsakos, G, & Luaces, VLd. (2010). Healthy mind and body in a healthy work environment. *International Dental Journal, 60*, 395-398.

Perlman, DM, Salomons, TV, Davidson, RJ, & Lutz, A. (2010). Differential effects on pain intensity and unpleasantness of two meditation practices. *Emotion, 10*(1), 65-71.

Peterson, C, Park, N, & Seligman, M. (2005). Orientations to happiness and life satisfaction: The full life versus the empty life *Journal of Happiness Studies, 6*, 25-41. doi: DOI 10.1007/s10902-004-1278-z

Pinheiro, FA, Tróccoli, BT, & Carvalho, CVd. (2002). Validação do questionário nórdico de sintomas osteomusculares como medida de morbidade. *Rev. Saúde Pública, 36*(3).

Pozos-Radillo, BE, Lopez, TMT, Velasco, LA, Fernandez, MA, & Perez, GJG. (2008). Stress-associated factors in mexican dentists. *Braz Oral Res, 22*(3), 223-228. doi: S1806-83242008000300006 [pii]

Prins, JT, Gazendam-Donofrio, SM, Tubben, BJ, Heijden, FMMAVD, Wiel, HBMVD, & Hoeksra-Weebers, JEHM. (2007). Burnout in medical resident: A review. *Medical Education, 41*, 788-800.

Przyrembel, M, Smallwood, J, Pauen, M, & Singer, T. (2012). Illuminating the dark matter of social neuroscience: Considering the problem of social interaction from philosophical, psychological, and neuroscientific perspectives. *Frontiers in Psychology, 6*(190).

Rafeemanesh, E, Jafari, Z, Kashani, EO, & Rahimpour, E. (2013). A study on job postures and musculoskeletal illnesses in dentists. *International Journal of Occupational Medicine and Environmental Health, 26*(4), 615 – 620.

Ramadoss, R, & Bose, BK. (2010). Transformative life skills: Pilot studies of a yoga model for reducing perceived stress and improving self-control in vulnerable youth. *International Journal of Yoga Therapy, 20*.

Ratzon, NZ, & Mizrachi, N. (2008). The presence of musculoskeletal disorders among amateur bowlers. *Work*, 369-375.

Ray, RD, Wilhelm, FH, & Gross, JJ. (2008). All in the mind's eye? Anger rumination and reappraisal. *Journal of Personality and Social Psychology,, 94*(1), 133–145.

Reekum, CMv, Schaefer, SM, Lapate, RC, Norris, CJ, Greischar, LL, & Davidson, RJ. (2011). Aging is associated with positive responding to neutral information but reduced recovery from negative information. *SCAN, 6*, 177-185.

Remor, E. (2006). Psychometric properties of a european spanish version of the perceived stress scale (pss). *The Spanish Journal of Psychology, 9*(1), 86-93.

Resende, EMSL. (2009). *Contributo para o estudo da influência do stress na resposta imunitária à vacina contra a gripe em profissionais de saúde.* (Doutoramento em Saude Pública), Escola Nacional de Saúde Pública - Universidade Nova de Lisboa, Lisboa. Retrieved from http://hdl.handle.net/10362/3987

Ribeiro, JLP. (2012). Validação transcultural da escala de felicidade subjectiva de lyubomirsky e lepper. *Psicologia, Saúde & Doenças, 13*(2), 157-168.

Ribeiro, JLP, & Antunes, S. (2003, Junho). Contribuição para o estudo de adaptação do questionário de saúde geral de 28 itens (general health questionnaire - ghq28). *Revista Portuguesa de Psicossomática, 5,* 37-45.

Ribeiro, JP, & Marques, T. (2009). A avaliação do stresse: A propósito de um estudo de adaptação da escala de percepção de stresse. *Psicologia, Saúde & Doenças, 10*(2), 237-248.

Ricard, M. (2003). *Happiness*. New York.

Ricard, M. (2005). *Em defesa da felicidade*. Cascais: Editora Pergaminho.

Ricard, M. (2013). *Plaidoyer pour l'altruisme: La force de la bienveillance*. Paris: NiL Éditions.

Ricard, M. (2015). *Altruism*. New York: Litle Brown and Company.

Richard, J, Butler, E, & Gross, JJ. (2003). Regulation emotion in romantic relationships: The cognitive consequences of concealing feelings. *Journal of Social and Personal Relationships, 20*(5), 599-620.

Richards, JM, & Gross, JJ. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology, 79*(3), 410-424.

Riediger, M, Wrzus, C, & Wagner, GG. (2014). Happiness is pleasant, or is it? Implicit representations of affect valence are associated with contrahedonic motivation and mixed affect in daily life. *Emotion, 14*(5), 950–961.

Robinson, K, Kennedy, N, & Harmon, D. (2012). Happiness: A review of evidence relevant to occupational science. *Journal of Occupational Science, 19*(2).

Rocke, C, Li, S-C, & Smith, J. (2009). Intraindividual variability in positive and negative affect over 45 days: Do older adults fluctuate less than young adults? *Psychology and Aging, 24*(4), 863–878.

Rodrigues, R, & Pedro, R. (2013). Prevalência de lesões músculo-esqueléticas relacionadas com trabalho em fisioterapeutas portugueses e fatores de risco associados *Revista de Ciências da Saúde da ESSCVP, 5*.

Rojas, M, & Veenhoven, R. (2013). Contentment and effect in the estimation of happiness. *Social Indicators Research, 110*, 415-431. doi: 10.1007/s11205-011-9952-0

Rolander, B, & Bellner, A-L. (2001). Experience of musculo-skeletal disorders, intensity of pain, and general conditions in work - the case of employees in non-private dental clinics in a county in southern sweden. *Work, 17*, 65-73.

Rolander, B, Karsznia, A, Jonker, D, Oberg, T, & Bellner, A-L. (2005). Perceived contra observed physical work load in swedish dentists. *Work, 25*, 253-262.

Rosenberg, EL, Ekman, P, Jiang, W, Babyak, M, Coleman, RE, Hanson, M, Christopher O'Connor, Waugh, R, & Blumenthal, JA. (2001). Linkages

between facial expressions of anger and transient myocardial ischemia in men with coronary artery disease. *Emotion, 1*(2), 107-115.

Rottenberg, J, & Gross, JJ. (2003). When emotion goes wrong: Realizing the promise of affective science. *Clinical Psychology: Science and Practice, 10*, 227-232.

Rout, U. (1999). Gender differences in stress, satisfaction and mental wellbeing among general practitioners in england. *Psychology, Health & Medicine, 4*(4).

Røysamb, E, Tambs, K, Reichborn-Kjennerud, T, Neale, MC, & Harris, JR. (2003). Happiness and health: Environmental and genetic contributions to the relationship between subjective well-being, perceived health, and somatic illness. *Journal of Personality and Social Psychology, 85*(6), 1136–1146.

Ruby, FJM, Smallwood, J, Sackur, J, & Singer, T. (2013). Is self-generated thought a means of social problem solving? *Frontiers in Psychology, 4*(962).

Ruch, W, Harzer, C, Proyer, RT, Park, N, & Peterson, C. (2010). Ways to happiness in german-speaking countries: The adaptation of the german version of the orientations to happiness questionnaire in paper-pencil and internet samples. *European Journal of Psychological Assessment 2010, 26*(3), 227-234.

Ruch, W, Martínez-Martí, ML, Heintz, S, & Brouwers, SA. (2014). Short form of the orientations to happiness questionnaire for the german-speaking countries. *Swiss Journal of Psychology, 73*(4), 225–234.

Rutter, H, Herzberg, J, & Paice, E. (2002). Stress in doctors and dentists who teach. *Medical Education, 36*(6), 543-549.

Ryan, RM, & Deci, EL. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annu. Rev. Psychol., 52*, 141–166.

Ryff, CD, Love, GD, Urry, HL, Muller, D, Rosenkranz, MA, Friedman, EM, Davidson, RJ, & Singer, B. (2006). Psychological well-being and ill-being: Do they have distinct or mirrored biological correlates? *Psychother Psychosom, 75*, 85-95.

Ryff, CD, & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry, 9*(1), 1-28.

Sabini, J, & Silver, M. (2005). Ekman's basic emotions: Why not love and jealousy? *Cognition And Emotion, 19*(5), 693-712.

Sachs, J. (2012). Introduction. In J. F. Helliwell, R. Layard, & J. D. Sachs (Eds.), *World happiness report 2012* (pp. 2-9).

Salovey, P, Rothman, AJ, Detweiler, JB, & Steward, WT. (2000). Emotional states and physical health. *American Psychologist, 55*(1), 110-121.

Sánchez, FXD, & Sánchez, MdPJ. (2009). Processos cognitivos y emociones positivas *Emociones positivas* (pp. 333-362).

Sapolsky, R. (2011). The neurobiology of the adaptive and deleterious features of stress. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 76-80). Oakland, CA USA: New Harbinger Publications, Inc.

Sapolsky, RM. (2007). Stress, stress-related disease, and emotional regulation. In J. Gross (Ed.), *Handbook of emotion regulation* (pp. 606-615). New York: The Guilford Press.

Sato, K, & Yuki, M. (2014). The association between self-esteem and happiness differs in relationally mobile vs. Stable interpersonal contexts. *Frontiers in Psychology, 5*(1113).

Schmitt, NW, & Klimoski, RJ. (1991). *Research methods in human resources management*. Cincinnati, OH: Southwestern.

Schmitter, M, Liedl, M, Beck, J, & Rammelsberg, P. (2008). Chronic stress in medical and dental education. *Medical Teacher, 30*, 97-99.

Schueller, SM, & Parks, AC. (2014). The science of self-help: Translating positive psychology research into increased individual happiness. *European Psychologist, 19*(2), 145–155.

Schulreich, S, Heussen, YG, Gerhart, H, Mohr, PNC, Binkofski, FC, Koelsch, S, & Heekeren, HR. (2014). Music-evoked encidental happiness modulates probability weighting during risky lottery choices. *Frontiers in Psychology, 4*(981).

Scott, SB, Sliwinski, MJ, Mogle, JA, & Almeida, DM. (2014). Age, stress, and emotional complexity: Results from two studies of daily experiences. *Psychology and Aging, 29*(3), 577-587.

Segal, Z. (2011). Mindfulness-based cognitive therapy and the prevention of relapse in recurrent depression. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 102-109). Oakland, CA USA: New Harbinger Publications, Inc.

Seifert, TL. (2004). Understanding student motivation. *Educacional Research, 46*(2), 137-149.

Seligman, M. (2011a). *Flourish: A new understanding of happiness and well-being and how to achieve them*. Clerkenwell, London: Nicholas Brealey Publishing.

Seligman, MEP. (2003). *Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment*. Clerkenwell, London: Nicholas Brealey Publishing.

Seligman, MEP. (2008). Positive health. *Applied Psychology: An International Review, 57*, 3-18.

Seligman, MEP. (2011b). *A vida que floresce*. Alfragide EstrelaPolar.

Seligman, MEP, & Csikszentmihalyi, M. (2000). Positive psychology an introduction. *American Psychologist, 55*(1).

Séneca, LA. (1965). *Cartas a lucílio* (2ª ed.). Lisboa: Fundação Calouste Gulbenkian.

Serranheira, F, Cotrim, T, Rodrigues, V, Nunes, C, & Sousa-Uva, A. (2012). Nurses´ working tasks and msds back symptoms: Results from a national survey. *Work, 41*, 2449-2451.

Serranheira, F, Lopes, F, & Uva, AS. (2005). Lesões músculo-esqueléticas (lme) e trabalho: Uma associação muito frequente. *Saúde & Trabalho, 5*, 59-88.

Serranheira, F, Pereira, M, Santos, CS, & Cabrita, M. (2003). Auto-referência de sintomas de lesões músculo-esqueléticas ligadas ao trabalho (lmelt) numa grande empresa em portugal. *Revista Portuguesa de Saúde Pública, 21*(2).

Shaver, PR, & Mikulincer, M. (2007). Adult attachment strategies and the regulation of emotion *Handbook of emotion regulation* (pp. 446-465).

Sheldon, KM, Abad, N, Ferguson, Y, Gunz, A, Houser-Marko, L, Nichols, CP, & Lyubomirsky, S. (2010). Persistent pursuit of need-satisfying goals leads to increased happiness: A 6-month experimental longitudinal study. *Motiv Emot, 34*, 39-48.

Sheldon, KM, Boehm, J, & Lyubomirsky, S. (2012). Variety is the spice of happiness: The hedonic adaptation prevention model. In I. B. S. David (Ed.), *Oxford handbook of happiness* (pp. 901-914). Oxford: UK: Oxford University Press.

Sheldon, KM, & Kasser, T. (2001). Getting older, getting better? Personal strivings and psychological maturity across the life span. *Developmental Psychology, 37*(4), 491-501.

Sheps, D. (2011). Mindfulness-based stress: Reduction and cardiovascular disase. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 152-154). Oakland, CA USA: New Harbinger Publications, Inc.

Sheridan, J. (2011). Neural-immune interaction. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 155-158). Oakland, CA USA: New Harbinger Publications, Inc.

Shonkoff, JP, Boyce, WT, & McEwen, BS. (2009). Neuroscience, molecular biology, and the childhood roots of health disparities. *JAMA, 301*(21).

Shteynberg, G, Hirsh, JB, Apfelbaum, EP, Larsen, JT, Galinsky, AD, & Roese, NJ. (2014). Feeling more together: Group attention intensifies emotion. *Emotion, 14*(6), 1102–1114.

Sibille, KT, Langaee, T, Burkley, B, Gong, Y, Glover, TL, King, C, III, JLR, Leeuwenburgh, C, Bradley, LA, & Fillingim, RB. (2012). Chronic pain, perceived stress, and cellular aging: An exploratory study. *Molecular Pain, 8*(12).

Siemer, M, Mauss, I, & Gross, JJ. (2007). Same situation - different emotions: How appraisals shape our emotion. *American Psychological Association, 7*(3), 592-600.

Simões, A. (1992). Ulterior validação de uma escala de satisfação com a vida(swls). *Rev.Port. de Pedagogia, XXVI*(3), 503-515.

Simões, M, Gonçalves, S, & Barbosa, L. (2003). Terapia pela reestruração vivencial e cognitiva (trvc) e cefaleia: Um estudo. *Psicologia da consciência: Pesquisa e reflexão em psicologia transpessoal* (pp. 103-116). Lisboa: Lidel - Edições técnicas, Lda.

Simões, M, Resende, M, & Gonçalves, S. (2003). *Psicologia da consciência*. Lisboa: LIDEL.

Simões, R, Santiago, E, Soares, D, & Pereira, JAL. (2008). Desordens musculo-esqueléticas relacionadas com o exercício profissional da medecina dentária. *Rev Port Estomatol Cir Maxilofac, 49*, 47-55.

Sin, NL, & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice-friendly meta-analysis. *Journal of Clinical Psychology: in session, 65*(5), 467--487.

Singer, W. (2011). Synchronization of brain rhythms as a possible mechanism for the unification of distributed mental processes. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 66-75). Oakland, CA USA: New Harbinger Publications, Inc.

Singh, G, Hankins, M, & Weinman, JA. (2004). Does medical school cause health anxiety and worry in medical students. *Medical Education, 38*, 479-481.

Sloan, DM. (2004). Emotion regulation in action: Emotional reactivity in experiential avoidance. *Behavior Research and Therapy, 42*(11), 1257-1270.

Slocum-Gori, SL, Zumbo, BD, Michalos, AC, & Diener, E. (2009). A note on the dimensionality of quality of life scales: An illustration with the satisfaction with life scale (swls). *Soc Indic Res, 92*, 489–496.

Smith, CK, Peterson, DF, Degenhardt, BF, & Johnson, JC. (2007). Depression, anxiety, and perceived hassles among entering medical students. *Psychology, Health & Medicine, 12*(1), 31-39.

Snyderman, R. (2011). Meditation and the future of health care. In J. Kabat-Zinn & R. Davidson (Eds.), *The mind's own physician: A scientific dialogue with the dalai lama on the healing power of meditation* (pp. 178-184). Oakland, CA USA: New Harbinger Publications, Inc.

Sousa, APd. (2012). *Caracterização da identificação de sintomas de lesões músculo-esqueléticas relacionadas com o trabalho em colaboradores de lares de idosos.* (Master Degree Dissertation), IPB - Instituto Politécnico de Bragança, Bragança.

Stack, S. (2001). Occupation and suicide. *Social Science Quarterly, 82*.

Steger, MF, Kashdan, TB, & Oishi, S. (2008). Being good by doing good: Daily eudaimonic activity and well-being. *Journal of Research in Personality, 42*, 22–42.

Stevens, J. (1996). *Applied multivariate statistics for the social sciences* (3rd ed.). Mahwah: Lawrence Erlbaum Associates.

Storbeck, J, & Clore, GL. (2007). On the interdependence of cognition and emotion. *Psychology Press, 21*(6), 1212-1237.

Strayer, J. (2002). The dynamics of emotions and life cycle identity. *journal of theory and research*, 47-79.

Stubbs, D, Krebs, E, Bair, M, Damush, T, Wu, J, Sutherland, J, & Kroenke, K. (2010). Sex differences in pain and pain-related disability among primary care patients with chronic musculoskeletal pain. *Pain Medicine, 11*, 232–239.

Stults-Kolehmainen, MA, & Sinha, R. (2014). The effects of stress on physical activity and exercise. *Sports Med, 44*, 81-121.

Swami, V, Stieger, S, Voracek, M, Dressler, SG, Eisma, L, & Furnham, A. (2009). Psychometric evaluation of the tagalog and german subjective happiness scales and a cross-cultural comparison. *Soc Indic Res, 93*, 393–406.

Swanson, V, & Power, KG. (1999). Stress, satisfaction and role conflict in dual-doctor partnerships. *Community, Work & Family, 2*(1), 67-88.

Swart, J, & Apsche, J. (2014). A comparative treatment efficacy study of conventional therapy and mode deactivation therapy (mdt) for adolescents with conduct disorders, mixed personality disorders, and experiences of childhood trauma. *International Journal of Behavioral Consultation and Therapy, 9*(1).

Sweeting, H, Young, R, & West, P. (2009). Ghq increases among scottish 15 year olds 1987–2006. *Soc Psychiatry Psychiatr Epidemiol, 44*, 579–586.

Sy, T, Côté, Sp, & Saavedra, R. (2005). The contagious leader: Impact of the leader's mood on the mood of group members, group affective tone, and group processes. *Journal of Applied Psychology, 90*(2), 295-305.

Sze, JA, Gyurak, A, Yuan, JW, & Levenson, RW. (2010). Coherence between emotional experience and physiology: Does body awareness training have an impact? *Emotion*, 1-12.

Szymanska, J. (2002). Disorders of the musculoskeletal system among dentists from the aspect of ergonomics and prophylaxis. *Ann Agric Environ Med, 9*, 169-173.

Tabachnick, BG, & Fidell, LS. (2006). *Using multivariate statistics* (5th ed.). Boston: Pearson Education Inc.

Tabak, N, & Koprak, O. (2007). Relationship between how nurses resolve their conflicts with doctors, their stress and job satisfaction. *Journal of Nursing Management, 15*, 321-331.

Tanikonda, R, & Koneru, S. (2014). Prevalence of work related musculoskeletal disorders among physicians, surgeons and dentists: A comparative study. *Annals of Medical and Health Sciences Research, 4*(4), 578-582.

Taskaya-Yilmaz, N, Ceylan, G, Guller, AU, Ergun, G, Çankaya, B, & Bek, Y. (2004). The level of burnout in a group of dental research assistants. *Stress and Health, 20*, 105-111.

Tezel, A. (2005). Musculoeskeletal compaints among a group of turkish nurses. *Intern. J. Neuroscience, 115*, 871-880. doi: DOI: 10.1080/00207450590897941

Tezel, A, Kavrut, F, Tezel, A, Kara, C, Demir, T, & Kavrut, R. (2005). Musculoskeletal disorders in left- and right-handed turkish dental students. *Intern. J. Neuroscience, 115*, 255-266.

Thompson, RA, & Meyers, S. (2007). Socialization of emotional regulation in the family. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 249-268). New York: The Guilford Press.

Toews, JA, Lockyer, JM, Dobson, DJG, Simpson, E, Brownell, AKW, Brennies, F, & Macpherson, KM. (1997). Analysis of stress levels among medical students, residents and graduate students at four canadian schools of medicine. *Academic Medicine, 72*(11), 997-1002.

Trigo, M, Canudo, N, Branco, F, & Silva, D. (2010). Estudo das propriedades psicométricas da perceived stress scale (pss) na população portuguesa. *Psychologica, 53*, 353-378.

Tugade, MM, & Fredrickson, BL. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *J Pers Soc Psychol, 86*(2), 320-333.

Turley, M, Kinirons, M, & Freeman, R. (1993). Occupational stress factors in hospital dentists. *British Dental Journal, 175*, 285-288.

Uchida, Y, Norasakkunkit, V, & Kitayama, S. (2004). Cultural constructions of happiness: Theory and empirical evidence. *Journal of Happiness Studies, 5*, 223-239.

Ugazio, G, Lamm, C, & Singer, T. (2012). The role of emotions for moral judgments depends on the type of emotion and moral scenario. *Emotion, 12*(3), 579–590.

Uva, AS, Carnide, F, Serranheira, F, Miranda, LC, & Lopes, MF. (2008). Lesões musculoesqueléticas relacionadas com o trabalho: Guia de orientação para a prevenção. *Direcção-Geral da Saúde*, 30.

Uysal, R, Satici, Bm, Satici, SA, & Akin, A. (2014). Subjective vitality as mediator and moderator of the relationship between life satisfaction and subjective happiness. *Educational Sciences: Theory & Practice, 14*(2), 489-497.

Vacharkulksemsuk, T, & Fredrickson, BL. (2012). Strangers in sync: Achieving embodied rapport through shared movements. *J Exp Soc Psychol., 48*(1), 399–402.

Valachi, B, & Valachi, K. (2003). Preventing muskuloskeletal disorders in clinical dentistry. *JADA, 134*, 1604-1612.

VanVoorhis, CRW, & Morgan, BL. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in Quantitative Methods for Psychology, 3*(2), 43-50.

Veenhoven, R. (2000-2009). Average happiness in 149 nations 2000-2009 *World Database of Happiness. Rank report Average.*, from worlddatabaseofhappiness.eur.nl/hap_nat/findingreports/RankReport_AverageHappiness.php

Veenhoven, R. (2004a). Happiness as an aim in public policy: The greatest happiness principle. In A. Linley & S. Joseph (Eds.), *Positive psychology in practice*. Hoboken, N.J., USA: John Wiley and Sons, Inc.

Veenhoven, R. (2004b). World database of happiness: Continuous register of research on subjective appreciation of life. *Social Indicators Research Series,, 24*.

Veenhoven, R. (2007). *Measures of gross national happiness*. Paper presented at the OECD - Measurability and policy relevance of happiness, Rome.

Veenhoven, R. (2008). Healthy happiness: Effects of happiness on physical health and the consequences for preventive health care. *J Happiness Stud, 9*, 449–469.

Veenhoven, R. (2011a). Can we get happier than we are? In I. Brdar (Ed.), *The human pursuit of well-being: A cultural approach*. New York: Springer Science.

Veenhoven, R. (2011b). Greater happiness for a greater number: Is that possible? If so, how? In K. M. Sheldon, T. B. Kashdan, & M. F. Steger (Eds.), *Designing positive psychology: Taking stock and moving forward,* (pp. 396-409). New York: Oxford University Press.

Veenhoven, R. (2012a). Cross-national differences in happiness: Cultural measurement bias or effect of culture? *International Journal of Wellbeing, 2*(4), 333-353. doi: 10.5502/ijw.v2.i4.4

Veenhoven, R. (2012b). Does happiness differ across cultures? In H. Selin & G. Davey (Eds.), *Happiness across cultures, views of happiness and quality of life in non-western cultures* (Vol. 6, pp. 451-472): Springer Dordrecht.

Veenhoven, R. (2012c). Happiness: Also known as 'life-satisfaction' and 'subjective well-being'. In K. C. Land, A. C. Michalos, & M. J. Sirgy (Eds.), *Handbook of social indicators and quality of life research* (pp. 63-77). Dordrecht, Netherlands: Springer Publishers.

Veenhoven, R. (2012d). Social development and happiness in nations. *Working Paper, International Institute of Social Studies (ISS) , Series Indices of Social Development, The Hague 3*.

Veenhoven, R. (2013a). Happy life years. *OECD factsheet, Ognanization for Economic Cooperation and Development, Paris, France*.

Veenhoven, R. (2013b). Overall satisfaction with life. In W. Glatzer (Ed.), *The global handbook of well-being*: Springer in press.

Veenhoven, R. (2014a). Affective component of happiness. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 80-83). Dordrecht, Netherlands: Springer.

Veenhoven, R. (2014b). Classic wisdom about ways to happiness: How does it apply today? In V. Giorgino (Ed.), *The pursuit of happiness and the traditions of wisdom* (pp. 1-12). Dordrecht, Netherlands: SpringerBriefs in Well-being and QOL research.

Veenhoven, R. (2014c). Consequences of happiness. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 1200-1203). Dordrecht, Netherlands: Springer.

Veenhoven, R. (2014d). Contentment. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 1262-1265). Dordrecht, Netherlands: Springer.

Veenhoven, R. (2014e). Databook of happiness. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 1448-1449). Dordrecht, Netherlands: Springer, .

Veenhoven, R. (2014f). Happiness measures. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research* (pp. 2669-2674). Dordrecht, Netherlands: Springer,.

Veenhoven, R. (2015a). Greater happiness for a greater number: Did the promise of enlightenment come true? *Accepted for publication in Social Indicators Research*.

Veenhoven, R. (2015b). Social conditions for human happiness: A review of research. *Accepted for publication in the International Journal of Psychology*.

Veenhoven, R, & Hagerty, M. (2006). Rising happiness in nations 1946–2004: A reply to easterlin. *Social Indicators Research, 79*, 21–436.

Veenhoven, R, & Vergunst, F. (2013). The easterlin illusion: Economic growth does go with greater happiness. *EHERO working paper, 1*.

Vera-Villarroel, P, Atenas, KC-, Pavez, P, Lillo, S, Bello, F, Díaz, N, & López, W. (2012). Money, age and happiness: Association of subjective wellbeing with socio-demographic variables. *Revista Latinoamericana de Psicología, 44*(2), 155-163.

Vie, TL, Glaso, L, & Einarsen, S. (2012). How does it feel? Workplace bullying, emotions and musculoskeletal complaints. *Scandinavian Journal of Psychology, 53*, 165–173.

Vuilleumier, P, Armony, JL, Driver, J, & Dolan, RJ. (2001). Effects of attention and emotion on face processing in the human brain: An event-related fmri study. *Neuron, 30*, 829-841.

Wadlinger, HA, & Isaacowitz, DM. (2006). Positive mood broadens visual attention to positive stimuli. *Motiv Emot, 30*, 89-101.

Wadlinger, HA, & Isaacowitz, DM. (2008). Looking happy: The experimental manipulation of a positive visual attention bias. *Emotion, 8*(1), 121-126.

Wallace, BA, & Shapiro, SL. (2006). Mental balance and well-being: Building bridges between buddhism and western psychology. *American Psychologist, 61*(7), 90–701.

Wang, L, & Murnighan, JK. (2014). Money, emotions, and ethics across individuals and countries. *J Bus Ethics, 125*, 163–176.

Watson, D, & Clark, LA. (1994). *The panas-x manual for the positive and negative affect schedule-expanded form*. The University of Iowa.

Watson, D, Clark, LA, & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The panas scale *Journal of Personality and Social Psychology, 54*(6), 1063-1070.

Watson, DC, & Sinha, B. (2008). Emotion regulation, coping, and psychological symptoms. *International Journal of Stress Management, 15*(3), 222–234.

Waugh, CE, & Fredrickson, BL. (2006). Nice to know you: Positive emotions, self–other overlap, and complex understanding in the formation of a new relationship. *J Posit Psychol, 1*(2), 93–106.

Weytens, F, Luminet, O, Verhofstadt, LL, & Mikolajczak, M. (2014). An integrative theory-driven positive emotion regulation intervention. *PLoS One, 9*(4).

Whitley, R, & Henwood, BF. (2014). Life, liberty, and the pursuit of happiness: Reframing inequities experienced by people with severe mental illness. *Psychiatric Rehabilitation Journal, 37*(1), 68-70.

Wilson, RF, Coward, PY, Capewell, J, Laidler, TL, Rigby, RC, & Shaw, TJ. (1998). Perceived sources of occupational stress general dental practitioners. *British Dental Journal, 184*.

Winwood, PC, & Winefield, AH. (2004). Comparing two measures of burnout among dentists in australia. *International Journal of Stress Management, 11*(3), 282-289.

Winzelberg, AJ, & Luskin, FM. (1999). The effect of a meditation training in stress levels in secondary school teachers. *Stress Med. , 15*, 69-77

. World happiness report (2012). In J. Helliwell, R. Layard, & J. Sachs (Eds.), (pp. 1-167).

. World happiness report (2013). In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), (pp. 1-153).

. World happiness report. (2015). In J. F. Helliwell, R. Layard, & J. Sachs (Eds.), (pp. 1-173).

Wynne-Jones, G, Buck, R, Porteous, C, Cooper, L, Button, LA, Main, CJ, & Phillips, CJ. (2011). What happens to work if you're unwell? Beliefs and attitudes of managers and employees with musculoskeletal pain in a public sector setting. *J Occup Rehabil, 21*, 31–42.

Yamalik, N. (2007). Musculoskeletal disorders(msds) and dental practice part.2 risk factors for dentistry, magnitude of the problem, prevention, and dental ergonomics. *International Dental Journal, 57*, 45-54.

Yi, J, Hu, X, Yan, B, Zheng, W, Li, Y, & Zhao, Z. (2013). High and specialty-related musculoskeletal disorders afflict dental professionals even since early training years. *J Appl Oral Sci., 21*(4), 376-382.

Yusoff, MSB. (2011). A multicenter study on validity of the medical student stressor questionnaire (mssq). *International Medical Journal, 18*(1), 14-18.

Zelazo, PD, & Cunningham, WA. (2007). Executive function mechanisms underlyng emotion regulation *Handbook of emotion regulation* (pp. 135-158).

Zulkefly, NS, & Baharudin, R. (2010). Using the 12-item general health questionnaire (ghq-12) to assess the psychological health of malaysian college students. *Global Journal of Health Science, 2*(1).

APPENDICES

Appendix 1. Questionnaire used for Study1, "Validation of Subjective Happiness Scales on Portuguese People"

VALIDAÇÃO EM PORTUGAL DE ESCALAS DE FELICIDADE SUBJECTIVA

Estudo de validação em Portugal das Escalas de Felicidade Subjectiva (SFHS e SA-DHS), desenvolvidas por Michael Dambrun (Université Blaise Pascal, França), Matthieu Ricard (Mind and Life Institute, EUA) e col, 2012

Coordenação: Rosário Mexia, médica dentista, Mestre em Psicologia das Emoções, no âmbito dos estudos para o grau de doutoramento pela Faculdade de Medicina Dentária da Universidade de Lisboa.

Orientação: Prof. Doutor Alexandre Cavalheiro (Universidade de Lisboa), Prof.ª Doutora Carla Moleiro (ISCTE-IUL-CIS, Lisboa); Prof.ª Doutora Nancy da Silva (Universidade de S. José, Califórnia, USA)

A SUA PRECIOSA PARTICIPAÇÃO É FACULTATIVA E ANÓNIMA
Todos Os Dados Serão Tratados Cientificamente

Obrigada pela sua colaboração e sinceridade nas respostas!

Idade: ☐ **Estado Civil:** Casado/Comunhão ☐ Solteiro ☐ Divorciado ☐ Viúvo ☐

Sexo: F ☐ M ☐ **Tem Filhos?** Não ☐ Sim ☐ Quantos? ☐

Ocupação: Estudante ☐ Reforma ☐ Desemprego ☐ Ativo ☐

Qual a profissão que exerce? _____

Região Habitacional: (Portugal) **Ilhas** ☐ **Continente** ☐ **Distrito:** _____

Emigrante ☐ **País:** _____

Grau de Escolaridade: 2ºCiclo ☐ 9ºAno ☐ 12ºAno/Curso Profissional ☐ Licenciatura ☐

Mestrado/Especialização ☐ Outra ☐ Qual? _____

Nível Socioeconómico: (Sentido, por comparação com a População Portuguesa) Muito Baixo ☐ Baixo ☐ Médio ☐ Alto ☐ Muito Alto ☐

Professa alguma Religião? Não ☐ Sim ☐ Qual? _____

Envolvimento Religioso: (Responder se a resposta à questão anterior for **SIM**) Muito Pequeno ☐ Pequeno ☐ Médio ☐ Grande ☐ Muito Grande ☐

Pratica Desporto? Não ☐ Sim ☐ **Quantas vezes por semana?** 1 ☐ 2 ☐ 3 ☐ Mais ☐

Qual/Quais? | | | | |

Indique (por ordem de importância: 1º, 2º, 3º e 4º) quais os fatores que, na sua vida, mais contribuem para a sua felicidade?

Estabilidade Económica ☐ Estabilidade Familiar ☐ Paz Interior ☐ Sucesso Profissional ☐

Outro (s) ☐ Qual/Quais? _____

Indique (por ordem de importância: 1º, 2º, 3º e 4º) quais os fatores que, na sua vida, mais podem perturbar a sua felicidade?

Instabilidade Económica ☐ Instabilidade Familiar ☐ Instabilidade Emocional ☐ Instabilidade Profissional ☐

Outro (s) ☐ Qual/Quais? _____

Escalas de Felicidade Subjetiva

Adaptadas das Escalas de Felicidade Subjetiva, SFHS e SA-DHS, desenvolvidas por Michael Dambrun (Université Blaise Pascal, França), Matthieu Ricard (Mind and Life Institute, EUA) e colaboradores, 2012. Gentilmente autorizadas pelos autores.

Para cada uma das afirmações, indique a opção que melhor se adapta a si, colocando uma cruz no rectângulo correspondente

Escala de Felicidade Subjetiva Instável

Ao longo da minha vida…

	Discordo Muito	Discordo	Discordo um Pouco	Não Concordo Nem Discordo	Concordo um Pouco	Concordo	Concordo Muito
	1	2	3	4	5	6	7
1. Tenho tido satisfações e também grandes desilusões.							
2. Os períodos de prazer que tenho tido são sempre seguidos de período de descontentamento.							
3. O meu nível de serenidade é muito variável.							
4. Tenho tido períodos de euforia mas são quase sempre seguidos por períodos muito menos excitantes.							
5. Mudo muitas vezes de euforia para tristeza.							
6. Períodos de mal-estar seguem períodos de bem-estar.							
7. O meu nível de felicidade é bastante instável, algumas vezes alto, outras baixo.							
8. Passo muitas vezes de um alto nível de prazer para um baixo nível de prazer.							
9. Tenho períodos em que mudo de um momento para o outro de extrema felicidade para momentos muito menos satisfatórios.							
10. No mesmo dia estou feliz e outras vezes triste.							

Escala de Felicidade Subjetiva Autêntica e Estável

Na sua vida, qual o seu nível regular de...

	Muito Baixo	Baixo	Um Pouco Baixo	Nem Alto Nem Baixo	Um Pouco Alto	Alto	Muito Alto
	1	2	3	4	5	6	7
1. Bem-estar geral?							
2. Felicidade?							
3. Prazer?							
4. Êxtase (felicidade que parece completa)?							
5. Paz de espírito?							
6. Satisfação?							
7. Serenidade?							
8. Descontentamento?							
9. Beatitude (Felicidade perfeita)?							
10. Paz interior?							
11. Realização total?							
12. Alegria?							
13. Sentir-se mal?							
14. Tranquilidade (calma interior)?							
15. Plenitude (Sensação de satisfação absoluta, felicidade, realização total)?							
16. Infelicidade?							

Escala de Afetos Positivos e Negativos – (PANAS)

Original de Watson, Clark & Tellegen, 1988. Adaptado e validado para a população portuguesa por Galinha e Pais–Ribeiro, 2005. Versão portuguesa gentilmente autorizada pelos autores.

Diga como geralmente sente (em média) cada uma das emoções e sentimentos enunciados ao lado, assinalando no quadrado correspondente a opção que melhor se adapta a si.

1 = nada ou muito ligeiramente

5 = extremamente.

	Nada ou Muito Ligeiramente	Um pouco	Moderadamente	Bastante	Extremamente
	1	*2*	*3*	*4*	*5*
Interessado					
Orgulhoso					
Perturbado					
Irritado					
Excitado					
Encantado					
Atormentado					
Remorsos					
Agradavelmente Surpreendido					
Inspirado					
Culpado					
Nervoso					
Assustado					
Determinado					
Caloroso					
Trémulo					
Repulsa					
Activo					
Entusiasmado					
Amedrontado					

Escala de Satisfação com a Vida – (SWLS)

Original de Diener, Emmons, Larsen & Griffin, 1985; 1ª adaptação e validação para a população portuguesa: Neto, Barros e Barros, 1990. Ulterior validação por Simões em 1992, gentilmente cedida pelo autor.

Diga, em que medida concorda ou discorda com cada uma das frases seguintes

	Discordo Muito	Discordo um Pouco	Nem Concordo Discordo	Concordo um Pouco	Concordo Muito
	1	*2*	*3*	*4*	*5*
A minha vida parece-se, em quase tudo, com o que eu desejaria que ela fosse.					
As minhas condições de vida são muito boas.					
Estou satisfeito com a minha vida.					
Até agora, tenho conseguido as coisas importantes da vida que eu desejaria.					
Se eu pudesse recomeçar a minha vida, não mudaria quase nada.					

Appendix 2. Table of Pearson correlations Comparing Online and paper/pencil methods - SFHS, SA-DHS, Negative Affect, Positive Affect and Satisfaction With Life

		SFHS		SA-DHS				NA		PA	
				Contentment		Inner-Peace					
		On	PP	On	PP	On	PP	On	PP	On	PP
SFHS											
SA-DHS	Contentment	-.47	-.29**								
	Inner-Peace	-.50**	-.31**	.74**	.67**						
NA		.51**	.36**	-.37**	-.30**	-.44**	-.33**				
PA		-.22**	-.12**	.56**	.50**	.42**	.37**	-.05	.01		
SWLS		-.43**	-.30**	.73**	.63**	.55**	.44**	-.37**	-.20**	.44**	.38**

Appendix 3. Questionnaire used for Study2, "Relationship between Happiness, Stress and Musculoskeletal Disorders in Portuguese Dentists"

"Estudo da Relação entre a Felicidade, o Stress e as Lesões Músculo-Esqueléticas nos Médicos Dentistas em Portugal"

Coordenação: Rosário Mexia, médica dentista, Mestre em Psicologia das Emoções, no âmbito dos estudos para o grau de doutoramento pela Faculdade de Medicina Dentária da Universidade de Lisboa.
Orientação: Prof. Doutor Alexandre Cavalheiro (Universidade de Lisboa), Prof.ª Doutora Carla Moleiro (ISCTE-IUL-CIS, Lisboa); Prof.ª Doutora Nancy da Silva (Universidade de San Jose, Califórnia, USA)

Caros(as) Colegas:

Estou a fazer o estudo da relação entre a felicidade subjetiva, o stress sentido e a presença de sinais e/ou sintomas de lesões músculo-esqueléticas nos médicos dentistas em Portugal, dentro do âmbito dos meus estudos para obtenção do grau de doutoramento em Medicina Dentária, pela Faculdade de Medicina Dentária da Universidade de Lisboa.
O **preenchimento** destes questionários é parte **muito importante** deste trabalho.
Agradeço a cooperação de todos os que quiserem / puderem.
A vossa preciosa colaboração é facultativa.
As respostas são anónimas e os dados tratados com fins científicos.
Por favor, respondam assinalando nos espaços correspondentes.
A TODOS OS QUE COLABORAREM O MEU MUITO OBRIGADA!

Sexo: F ☐ M ☐ Idade ☐ Altura: ☐ Peso: ☐

Médico Dentista ☐ Estomatologista ☐ Ambas ☐

Ano da Licenciatura na área de Medicina Dentária: ☐

Qual o seu grau académico mais elevado: Licenciatura ☐ Mestrado integrado ☐ Mestrado ☐ Doutoramento ☐ Postdoc ☐

Há quantos anos exerce? ☐ Distrito onde exerce? ☐

Carga horária semanal:
SÓ no exercício clínico de medicina dentária - de 20h ☐ 20-30h ☐ 30-40h ☐ + de 40h ☐
SÓ no exercício de outras funções laborais que, eventualmente, exerça - de 20h ☐ 20-30h ☐ 30-40h ☐ + de 40h ☐

Exercício clínico em: Consultório/Clínica Próprio ☐ Consultório/Clínica de Outrem ☐ Ambos ☐

Indique o número máximo de colegas que, no exercício clínico de Medicina Dentária, poderá trabalhar comigo no mesmo espaço – clínica/consultório? Nenhum ☐ 1 ☐ 2 ☐ 3 ☐ Mais de 3 ☐

Dedica-se em especial ao exercício clínico nalguma área da Medicina Dentária?
Não ☐ Sim, ☐ Ortodôncia
☐ Cirurgia
☐ Endodôntia
☐ Dentisteria
☐ Prostodontia
☐ Periodontia
☐ Outra

Há alguma área da medicina dentária que tenha deixado de exercer por problemas relacionados com a sua saúde/doença?
Não ☐ Sim ☐

Qual a área especifica da Medicina Dentária que deixou de exercer, por motivos de doença?
Cirurgia ☐ Endodontia ☐ Todas as areas de Medicina Dentária ☐ Outro (s) ☐

Por que motivo? Stress ☐ Doença Coronária ☐ Doença Psicológica ☐ Doença Neurológica ☐ Doença Músculo-Esquelética ☐
Outro (s) ☐ Qual/Quais? _____

Acumula alguma outra atividade profissional para além do exercício da Medicina Dentária?
Não ☐ Sim ☐ Qual? ☐

Acumula função de docência em algum estabelecimento de ensino?
Não ☐ Sim ☐ Regime Total ☐ Regime Parcial ☐

No decorrer da sua atividade clínica, costuma intercalar momentos de pausa?
Não ☐ Se sentir necessidade ☐ Sim ☐

Se sim, qual a frequência das suas pausas? 1 pausa de 2 em 2 horas ☐ 1 pausa por manhã ou tarde ☐
Outra ☐ Maior frequência ☐ Menor frequência

Quanto tempo duram as suas pausas? <5min ☐ 5-10min ☐ >10min ☐

Indique qual (quais) o(s) objetivo(s) das suas pausas:
☐ Para aliviar a tensão muscular
☐ Para aliviar a tensão psicológica
☐ Ambas
☐ Outra

Pratica Desporto? Não ☐ Sim ☐ Quantas vezes por semana? 1 ☐ 2 ☐ 3 ☐ Mais ☐

Pratica Yoga e/ou Meditação? Não ☐ Sim ☐ Quantas vezes por semana? 1 ☐ 2 ☐ 3 ☐ Mais ☐

Professa alguma Religião, ou prática espiritual? Não ☐ Sim ☐ Qual? _____

Como considera o seu envolvimento religioso / espiritual: Muito Pequeno ☐ Pequeno ☐ Médio ☐ Grande ☐ Muito Grande ☐

Indique (por ordem de importância: do 1º ao 6º) quais os fatores que, na sua vida, mais contribuem para a sua felicidade?
Estabilidade Económica ☐ Estabilidade Familiar ☐ Paz Interior ☐ Sucesso Profissional ☐
Relações de Amizade ☐ Outro(s) ☐

Indique (por ordem de importância: do 1º ao 6º) quais os fatores que, na sua vida, mais podem perturbar a sua felicidade?
Instabilidade Económica ☐ Instabilidade Familiar ☐ Instabilidade Emocional ☐ Instabilidade Profissional ☐
Situações de Doença ☐ Outro(s) ☐

É hipertenso?
Sim ☐ Não ☐ Não sei ☐

Toma medicação para a pressão arterial?
Sim ☐ Não ☐

Quais os valores habituais da sua pressão sistólica? (entre 80 e 220mmHg) ☐ Não sei ☐

Quais os seus valores de pressão diastólica? (entre 50 e 120mmHg) ☐ Não sei ☐

Como avalia os níveis de stress que sente:	Excessivo	Quase Sempre Presente	Às vezes Presente	Raramente Presente	Inexistente
No exercício profissional					
No contexto familiar					
De um modo geral					

De um modo geral como classifica o seu estado de saúde geral ?

1	2	3	4	5
Muito Mau	Mau	Bom	Muito Bom	Excelente

Escalas FS

Adaptadas das Escalas de Felicidade Subjetiva, SFHS e SA-DHS, desenvolvidas por Michael Dambrun (Université Blaise Pascal, França), Matthieu Ricard (Mind and Life Institute, EUA) e colaboradores, 2012. Gentilmente autorizadas pelos autores.

Para cada uma das afirmações, indique a opção que melhor se adapta a si, assinalando no espaço correspondente

Escala FSI

Ao longo da minha vida...	Discordo Muito	Discordo	Discordo um Pouco	Não Concordo Nem Discordo	Concordo um Pouco	Concordo	Concordo Muito
	1	2	3	4	5	6	7
1. Tenho tido satisfações e também grandes desilusões.							
2. Os períodos de prazer que tenho tido são sempre seguidos de período de descontentamento.							
3. O meu nível de serenidade é muito variável.							
4. Tenho tido períodos de euforia mas são quase sempre seguidos por períodos muito menos excitantes.							
5. Mudo muitas vezes de euforia para tristeza.							
6. Períodos de mal-estar seguem períodos de bem-estar.							
7. O meu nível de felicidade é bastante instável, algumas vezes alto, outras baixo.							
8. Passo muitas vezes de um alto nível de prazer para um baixo nível de prazer.							
9. Tenho períodos em que mudo de um momento para o outro de extrema felicidade para momentos muito menos satisfatórios.							
10. No mesmo dia estou feliz e outras vezes triste.							

Para cada uma das questões, indique a opção que melhor se adapta a si, assinalando no espaço correspondente

Escala FSA-E

Na sua vida, qual o seu nível regular de...	Muito Baixo	Baixo	Um Pouco Baixo	Nem Alto Nem Baixo	Um Pouco Alto	Alto	Muito Alto
	1	2	3	4	5	6	7
1. Bem-estar geral?							
2. Felicidade?							
3. Prazer?							
4. Êxtase (felicidade que parece completa)?							
5. Paz de espírito?							
6. Satisfação?							
7. Serenidade?							
8. Descontentamento?							
9. Beatitude (Felicidade perfeita)?							
10. Paz interior?							
11. Realização total?							
12. Alegria?							
13. Sentir-se mal?							
14. Tranquilidade (calma interior)?							
15. Plenitude (Sensação de satisfação absoluta, felicidade, realização total)?							
16. Infelicidade?							

ESCALA PS

Escala desenvolvida por Cohen et al., 1983. Adaptada à população portuguesa por PaisRibeiro& Marques, 2006.
Nesta escala são feitas perguntas acerca dos sentimentos e pensamentos que teve no último mês. Para cada uma das questões indique, por favor, com que frequência sentiu ou pensou de determinada maneira. Embora algumas questões sejam parecidas, existem diferenças entre elas. Por favor, responda a cada uma como sendo uma questão diferente. A melhor maneira de o fazer é responder rapidamente a cada questão, sem se preocupar com número de vezes que se sentiu de determinada maneira.

	Nunca	Quase Nunca	Algumas Vezes	Com muita Frequência	Muitas vezes
1. No último mês com que frequência se sentiu aborrecido com algo que ocorreu inesperadamente?					
2. No último mês com que frequência se sentiu que era incapaz de controlar as coisas que são importantes na sua vida?					
3. No último mês com que frequência se sentiu nervoso ou "stressado"?					
4. No último mês com que frequência enfrentou com sucesso coisas aborrecidas e chatas?					
5. No último mês com que frequência sentiu que estava a enfrentar com eficiência mudanças importantes que estavam a ocorrer na sua vida?					
6. No último mês com que frequência se sentiu confiante na sua capacidade para lidar com os seus problemas pessoais?					
7. No último mês com que frequência sentiu que as coisas estavam a correr como queria?					
8 No último mês com que frequência reparou que não conseguia fazer todas as coisas que tinha que fazer?					
9. No último mês com que frequência se sentiu capaz de controlar as suas irritações?					
10. No último mês com que frequência sentiu que as coisas lhe estavam a correr pelo melhor?					
11. No último mês com que frequência se sentiu irritado com coisas que aconteceram e que estavam fora do seu controlo?					
12. No último mês com que frequência foi capaz de controlar o seu tempo?					
13. No último mês com que frequência sentiu que as dificuldades se acumulavam ao ponto de não ser capaz de as ultrapassar?					

QUESTIONÁRIO PSSLME

Desenvolvido a partir do questionário nórdico músculo-esquelético (Kuorinka, Jonsson et al. 1987), e das versão portuguesa (Mesquita 2011) e versão adaptada do mesmo (Serranheira, Pereira et al. 2003), gentilmente cedidas pelos autores.

Adaptado aos médicos dentistas para o estudo "Relationship Between Happiness, Stress and Musculosqueletal Disorders in Portuguese Dentists"

Preencha a tabela seguinte, assinalando com uma cruz no espaço correspondente à presença e à intensidade de incómodo, fadiga ou dor, para cada uma das zonas indicadas.
Na intensidade da dor a escala é de 1 a 4 : 1-Leve 2- Moderado 3- Intenso 4-Insuportável)

	Teve algum problema (desconforto, dor ou parestesia) durante os últimos 7 dias? Se sim, indique a sua intensidade.	Nos últimos 12 meses teve algum problema (desconforto, dor ou parestesia) nas seguintes regiões? Se sim, indique a sua intensidade.	Nos últimos 12 meses esteve impedido de realizar o seu trabalho normal devido a esse problema? Se sim, indique a sua duração.
1) Coluna Cervical	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
2) Ombros	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
3) Cotovelos	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
4) Punhos/ Mãos	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
5) Coluna Dorsal	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
6) Coluna Lombar	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
7) Ancas/ Coxas	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
8) Pernas/ Joelhos	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐
9) Tornozelos /Pés	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Intensidade da dor 1 2 3 4	Não ☐ Sim ☐ Com a Duração de ... Até 1 semana ☐ De 1 semana a 1 mês ☐ Mais do que 1 mês, mas não todos os dias ☐ Todos os dias ☐

Appendix 4. Pearson's Correlation Table from "Relationship between Happiness,Stress and Musculoskeletal lesions in Portuguese Dentists" Scales.

		1	2	3	4	5	6	7	8	9	10	11	12	13
1 m_SFHS	Pearson Corr													
2 SADHS_full	Pearson Corr	-.60**												
3 m_Content	Pearson Corr	-.54**	.97**											
4 m_ipeace	Pearson Corr	-.58**	.87**	.71**										
5 PSS_short	Pearson Corr	.55**	-.71**	-.67**	-.64**									
6 PSS_Full	Pearson Corr	.51**	-.67**	-.64**	-.60**	.97**								
7 m_MSQI	Pearson Corr	.23**	-.30**	-.30**	-.23**	.32**	.30**							
8 m_MSQII	Pearson Corr	.14**	-.24**	-.24**	-.19**	.30**	.28**	.82**						
9 m_MSQIII	Pearson Corr	.06	-.08	-.09	-.03	.12*	.12*	.34**	.41**					
10 Gender	Pearson Corr	-.01	.00	.00	.00	-.11*	-.09	-.17**	-.19**	-.02				
11 Age	Pearson Corr	-.02	-.05	-.07	.01	-.03	-.02	.05	.03	.05	.22**			
12 Y_Pract	Pearson Corr	-.03	-.00	-.02	.04	-.07	-.05	.05	.03	.02	.23**	.95**		
13 Prac_Sport	Pearson Corr	-.11*	.22**	.22**	.17**	-.15**	-.17**	-.18**	-.14**	.00	.07	-.02	-.01	
14 Prof_Religion	Pearson Corr	-.08	.08	.07	.08	-.07	-.09	.09	.07	.02	-.12*	.11*	.11*	-.00

Appendix 5. Introduction to the online questionnaire for dentists

Estudo: Relação entre Felicidade, Stress e Lesões Músculo-esqueléticas nos Médicos Dentistas em Portugal.

Coordenação: Rosário Mexia, médica dentista, Mestre em Psicologia das Emoções, no âmbito dos estudos para o grau de doutoramento pela Faculdade de Medicina Dentária da Universidade de Lisboa.

Orientação: Prof. Doutor Alexandre Cavalheiro (Universidade de Lisboa), Prof.ª Doutora Carla Moleiro (ISCTE-IUL-CIS, Lisboa); Prof.ª Doutora Nancy da Silva (Universidade de S. José, Califórnia, USA)

CONVITE DE PARTICIPAÇÃO no "Estudo da relação entre felicidade, stress e doenças musculo-esqueléticas nos médicos dentistas em Portugal"

Caros(as) Colegas:

Estou a fazer o estudo da relação entre a felicidade subjetiva, o stress sentido e a presença de sinais ou sintomas de lesões musculo-esqueléticas nos médicos dentistas em Portugal.

O preenchimento deste Questionários é parte muito importante do desenvolvimento do meu trabalho para obtenção do grau de doutoramento pela Faculdade de Medicina Dentária da Universidade de Lisboa.

Agradeço a cooperação de todos os que quiserem/ puderem, participando e difundindo o convite entre os nossos Colegas.

As respostas são anónimas e os dados tratados com fins científicos.

A amostra possível compreende TODOS OS MÉDICOS DENTISTAS E ESTOMATOLOGISTAS - quer habitem no Continente ou nas Ilhas.

POR FAVOR, DIVULGUEM ENTRE TODOS OS VOSSOS CONTACTOS e, se possível, motivem a colaboração .

Basta clicar no ...

link atribuído ……..

A todos os que colaborarem deixo o meu MUITO OBRIGADA!

Appendix 6. Ethical permission for Study1

Permissão ética para o estudo da validação
Pedido enviado por mail a 29/ 09 / 2013

Ex.mo Sr. Director da FMDUL
Sr. Professor Doutor João Aquino

no desenvolvimento dos meus trabalhos para obtenção do grau de doutoramento pela FMDUL, estou a validar dois questionários de Felicidade para a população portuguesa.
Estes questionários, uma vez validados, farão parte do projecto final da minha tese.

Gostaria de aplicar estes questionários, que envio em anexo, aos alunos da FMDUL, constituindo uma amostra em separado.

Venho, por este meio, solicitar à Faculdade a devida autorização para a sua aplicação.

Aguardando a resposta, deixo o meu obrigada e os meus melhores cumprimentos académicos

Rosário Mexia

Confirmo a autorização concedida via mail a 29 / 09 / 2013

.....

Aquino Marques
Director

Lisboa, 10 de Julho de 2015

Appendix 7 Ethical permission for Studies 2 and 3

Permissão ética para o estudo piloto

Pedido enviado por mail a 02/ 11 / 2013

Ex.mo Sr. Director da FMDUL
Sr. Professor Doutor João Aquino

Na sequência dos trabalhos desenvolvidos para a obtenção do grau de doutoramento pela Faculdade de Medicina Dentária da Universidade de Lisboa (FMDUL), devo fazer um teste piloto com os instrumentos que vou utilizar nos meus estudos - " Contribuição para o estudo da relação entre Felicidade, Stress e lesões Músculo-Esqueléticas nos Médicos Dentistas em Portugal".

Venho por este meio, solicitar a autorização para aplicar os questionários, que envio em anexo, aos Colegas em exercício na FMDUL.

Aguardando e agradecendo a resposta, deixo os meus melhores cumprimentos académicos

Rosário Mexia

Confirmo a autorização concedida via mail a 05 / 11 / 2013

.....

Aquino Marques
Director

Lisboa, 10 de Julho de 2015

Appendix 8. Ranking from World Database of Happiness

Nation	Average	Source
Argentina	7.0	(Veenhoven, 2007)
Canada	7.7	(Veenhoven, 2012c, 2013b)
Denmark	8.3	(Brulé & Veenhoven, 2014; Veenhoven, 2015a)
France	6.7	(Veenhoven, 2007)
Germany(W)	7.2	(Veenhoven, 2011a)
	6.9	(Veenhoven, 2007)
India	4.6	(Veenhoven, 2007)
Iran	5.9	
Japan	6.1	
Philippines	6.3	
Poland	5.8	
Portugal	5.7	R. Veenhoven, Happiness in Portugal (PT), World Database of Happiness, Erasmus University Rotterdam, The Netherlands. Viewed on 2015-08-02 at http://worlddatabaseofhappiness.eur.nl
Russia	5.4	(Veenhoven, 2012c, 2013b)
	4.1	(Veenhoven, 2007)
Sweden	7.9	(Veenhoven, 2007)
Switzerland	8.1	(Veenhoven, 2012c, 2013b)
	8.3	(Veenhoven, 2007)
UK	7.2	(Veenhoven, 2011b)
USA	7.4	(Veenhoven, 2007, 2012c)
	7.0	(Veenhoven, 2011b)

Zimbabwe	3.0	(Brulé & Veenhoven, 2014)
	3.1	(Veenhoven, 2013b)
	3.3	(Veenhoven, 2007, 2011a, 2011b)
Developed Nations	7.5	(Veenhoven, 2015a)
World average	5.5	(Veenhoven, 2011a, 2011b)

Appendix 9. Rankings from World Happiness Report

Nation	2010-2012 ("World happiness report ", 2013)		2012-2014 ("World happiness report," 2015)	
	Average	Ranking	Average	Ranking
Argentina	6.56	29	6.57↑	30↓
Canada	7.48	6	7.43↓	5↑
Denmark	7.69	1	7.53↓	3↓
France	6.76	25	6.58↓	29↓
Germany(W)	6.67	26	6.75↑	26→
India	4.77	111	4.57↓	117↓
Iran	4.64	115	4.69↑	110↑
Japan	6.06	43	5.99↓	46↓
Philippines	4.99	92	5.07↑	90↑
Poland	5.82	51	5.79↓	60↓
Portugal	5.10	85	5.10→	88↓
Russia	5.46	68	5.72↑	64↑
Sweden	7.48	5	7.36↓	8↓
Switzerland	7.65	3	7.58↓	1↑
UK	6.88	22	6.87↓	21↑
USA	7.08	17	7.12↑	15↑
Zimbabwe	4.83	103	4.61↓	115↓

Appendix 10. Averages for top ten countries World Happiness Report

	2010-2012 ("World happiness report ", 2013)		2012-2014 ("World happiness report," 2015)	
	Average	Ranking	Average	Ranking
Denmark, Norway, Switzerland, Netherlands, Sweden, Canada, Finland, Austria, Iceland and Australia	7.49*	10+		
Switzerland, Iceland, Denmark, Norway, Canada, Finland, Netherlands, Sweden, New Zealand and Australia			7.43*↓	10+
Senegal, Syria, Gomoros, Guinea, Tanzania, Rwanda, Burundi, Central African Republic, Benin and Togo	3.68*	10-		
Chad, Guinea, Ivory Coast, Burkina Faso, Afghanistan, Rwanda, Benin, Syria, Burundi and Togo			3.37*↓	10-
WORLD	5.16	156 Nations	5.34*↑	158 Nations

* Averages calculated by the author, based on the individuals values, published on mentioned references

GLOSSARIES

Glossary related to Neuroscience

Amygdala - A group of nuclei in the medial anterior part of the temporal lobe.*

Autonomic Nervous System - The part of the peripheral nervous system that supplies neural connections to glands and to smooth muscles of internal organs. Has two divisions: sympathetic and parasympathetic nervous systems. *

Axon - A single extension from the nerve cell that carries nerve impulses from the cell body to other neurons. *

Basal Ganglia - A group of forebrain nuclei (caudate nucleus, globus pallidus, and putamen) found deep within the cerebral hemispheres. *

Caudate Nucleus - One of the basal ganglia; it has a long extension or tail. *

Cerebral Cortex - The outer covering of the cerebral hemispheres, which consists largely of nerve cell bodies and their branches. *

Cerebral Hemispheres - The right and left halves of the forebrain. *

Cingulate Gyrus - A cortical portion of the limbic system, found in the frontal and parietal midline. * Gyrus in the medium cerebral hemisphere, superior to the corpus callosum. It contributes to the process of memory and emotions. **

Computerized Axial Tomography – CAT or CT - A noninvasive technique for examining brain structure in humans through computer analysis of X-ray absorption at several positions around the head; affords a virtual direct view of the brain. The resulting images are referred to as *Cat scans* or *Ct scans*. *

Corpus Callosum - The main band of axons that connects de two cerebral hemispheres. *

Dendrite - One of the extensions of the cell body that are the receptive surfaces of the neuron. *

Fornix - A fiber tract that extends from the hippocampus to the mammillary body. *

Functional MRI – fMRI - Magnetic resonance imaging that detects changes in blood flow and therefore identifies regions of the brain that are particularly active during a given task. *

Glial Cells - Also sometimes called *glia* or *neuroglia.* Noneural brain cells that provide structural, nutritional, and other types of support to the brain. *

Hippocampus - *(pl. hippocampi)* A medial temporal lobe structure that is important for the learning and memory. *

Hypothalamus - Part of the diencephalon, lying ventral to the thalamus. *

Magnetic Resonance Imaging – MRI – A noninvasive technique that uses magnetic energy to generate images that reveal some structural details in the living brain. *

Neural Plasticity - Neurons ability of changing their function, chemical profile (quantity and types of neurotransmitters produced) or structure. **

Neurotransmitter - Chemical substances present in the presynaptic axon that are released in the synaptic cleft, to transmit information between neurons. **

Positron Emission Tomography – PET - A technique for examining brain function by combining tomography with injections of radioactive substances. Analysis of the metabolism of these substances reflects regional differences in brain activity. *

Reticular Formation - An extensive region of the brainstem (extending from the medulla through the thalamus) that is involved in arousal. *

Thalamus - The brain regions at the top of the brainstem that trade information with the cerebral cortex. *

References for the Glossary related to Neuroscience

*(Breedlove, Rosenzweig e*t al.*, 2007).

**(Lundy-Ekman L, 2008).

Glossary related to Statistic Analysis

Internal consistency - is a type of reliability. The most popular index of internal consistency is coefficient alpha. Simplistically speaking, coefficient alpha is computed such that the items are split in a test in all possible ways and the split-half reliabilities are averaged. *

Bivariate correlation - is a statistic used to assess the extent to which two variables are linearly related**.***

Convergent validity – is when the correlations between similar traits measured by different methods is high and statistically significant**. ***

Cronbach's alpha - is a method for estimating the reliability; values ranging from .80 to .90 are considered good; values higher than .90 are excellent. **

Discriminant validity - tests whether methods that are supposed to be unrelated, are in fact unrelated**.***

Exploratory (EFA) and confirmatory factor analysis (CFA) - two main forms of factor analysis. ***

Factor analysis - is a statistical method to reduce a set of variables to a smaller number of factors in a scale or instrument being analyzed. ++++

Independent samples t-test - is a test that uses the t-statistic to establish if two means obtained from independent samples differ significantly**. ***

Multiple regression - is a statistical procedure that predicts an outcome from a set of measurement variables**.***

Predictor – is a quantitative variable used in regression to predict an outcome variable.***

Reliability - is the degree to which measures give the same values when they are repeated.***

Type 1 error - is the probability associated with the possibility that we falsely conclude that there

is a difference. Another definition: Type I error is the probability that we will conclude that there is a significant relationship, when, in fact, there is none.*

References for the Glossary related to Statistic Analysis

*(Schmitt & Klimoski, 1991)

**(Hill & Hill, 2012).

***(Holosko & Thyer, 2011)

**** (Moreira, 2009; Pereira, 2008)